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Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

Editorial Office: 1155 16th Street, N. W., Washington 6, D. C.

VOLUME XXXIII NO. 6

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Fun in the Harvest Field

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Considering . . . .

Kernels and Combines

Jeff McDermid

BILLION-BUSHEL-PLUS crops of wheat for each of six straight years have meant a terrific, overflowing tide of golden kernels from our fertile soils, to beat in breaking waves even to the coasts of Europe and beyond. These seven and a quarter billion bushels of the chief bread grain which this country has raised in six years since 1944 may be compared with four and five billion bushels produced in any similar span of time. This amazing world record in wheat production, to clog our huge elevators and spread dusty coats on busy millers, is not just a happy accident that happened at a time of emergency and human hunger.

On the contrary, the most of it is traceable to the agronomist, the soils specialist, and the mechanical engineer. These forces of science and progress, coupled with the willing and well-paid farmer, and blessed with generally favorable weather, have given us superabundance instead of ordinary plenty.

More than that, our better know-how is catching hold abroad as the foreign wheatlands recoup their losses and make their own comebacks to prewar production levels. This, as it naturally happens, throws the magnificent largesse of our plant, soil, and engine doctors smack dab into the laps of the economic doctors and interns who operate on crops that have high blood pressure due to excess fatness and inertia. The old adage that "nobody

loves a fat man" may be applied to the wheat crop—although we know in reality that it is false theorizing when a third of the world's populations is gaunt and emaciated, and would prefer the good humor of a rotund Falstaff to the sorrows of a skeleton.

When we older wiseacres were kids nobody fretted overmuch about the disposition of the land's abundance. Of course, the land was not so abundant then anyhow and there wasn't as much of it cultivated and seeded to food and feed. More home folks were muscle workers instead of white-collar "idlers." But that just scratches the surface of our so-called surplus dilemma, because world population as a whole is climbing fast, and even faster, they tell me, than the increase in our acre yields of wheat and corn.

WISER land-use projects have been advanced frequently as a panacea for this unbalance between bushels and bellies. But to quash that passing fancy, let's consider what Dr. Robert M. Salter, Chief of the Bureau of Plant Industry, U. S. Department of Agriculture, once stated:

"Those who look to improved land use for solution of the entire farm problem cannot escape disappointment. It cannot overcome the disparity of agriculture resulting from the comparatively elastic demand for the products of industry or from industry's advantage in tariff protection. It cannot reduce the exorbitant costs of distribution which today consume two-thirds of what the consumer pays for farm products. It cannot recover the wealth that has been drained from the country to the city by inheritance or by movement of farm youth off the land. It cannot solve the huge problem of farm tenancy. It cannot alter the fact that there are double the number of farmers and perhaps twice as much land as needed to supply the present demand for agricultural products. It can do little by itself to fulfill the crying need for greater outlets for the products of the land. The answers lie rather in the field of political economy."

But Dr. Salter did not quit there. He went on to say that increased efficiency and soil conservation are proper steps. He frowns on any scheme that tries to overcome surplus problems by penalizing efficiency. He rightly points out that the total cost to society of keeping a given sound standard of living on our farms—either in subsidies or otherwise—must vary inversely with the collective efficiency of agriculture. In other words, would any of us seek a solution to the wheat surplus by advocating ancient, costly methods of the pioneers, which are in wide use also in many countries abroad? If our wheat farmers were piddling producers, harvesting grain in hundred-bushel lots, using poor seed and poorer soil managements and rotations, would we feel justified in granting non-recourse loans or income payments or any form of financial encouragement to them? We still want food-makers, not famine-makers.

One might safely digress right here a moment to inject the idea that perhaps there should be some way of banishing from our favored and accepted list of wheat growers, under any loan or grant, all those who are mere absentee speculators and land-renting despoilers of the acreages now ripening with wheat. Such refinement of any forthcoming adjusted legislation might be only fair to those who conserve their farms and remain good stewards of the soil.

TO attempt any catalog of the soil scientist's great contributions to bumper and continually greater wheat yields would be like counting blades of grass. Each state and county had its own surveys and improvements to make, few of them exactly alike and all dependent upon acceptance and proper use of specific ways and means by the majority of the producers and landowners.

Hardly less easy to properly credit

for wheat betterment are the numerous State and Federal plant breeders and field crops specialists, both those in the research industry and the ones who took the message to Garcia through Extension demonstrations. All that we know is that in the decade from 1936 through 1946 more than 50 new varieties of wheat were distributed to growers in the commercial grain belt by Experiment Station workers.

These varieties were not just prettier ones, taller ones or shorter ones (to match the combine), or fancy ones to put into exhibit cases at shows. They were varieties obtained by selections and crosses to resist smut, rust, drought, insects, and winter-killing.

We had Thatcher spring wheat, a boon to growers when Marquis went down under stem rust outbreaks. But when Thatcher made good and swept the prairies only to droop when hit by leaf rust, then came the breeders with Renown variety, followed by Pilot and Rival, reasonably secure from the leaf rust that humbled Thatcher on some of our big wheat ranches. Then out in California stem rust continued to be severe, until science came across with Baart 38, and its companion, White Federation—both of which have eliminated this spore disease from the entire State.

Meanwhile things were not so good in the hard red winter wheat zones. Old standby varieties gave out from many causes, but high-yielding and resistant kinds soon replaced them, such as Tenmarq, Cheyenne, Pawnee, and Comanche. Scouts went to Russia and the Caucasus, the mid-European lands and Asia, and toted back promising kernels which were multiplied, tested, and finally distributed to take the wishing and the waiting out of the wheat game, in preparation for billion-bushel crops and mechanical marvels to handle them.

We used to think it was the last word in mechanics to see the big, wide binders drawn by several teams or tractors cutting the wheat crops on the prairie seas; but along came the engineers who connived together for even speedier harvesting. They figured and experimented and drew blueprints, aiming at a machine that would do away with the victual-consuming and time-wasting crews of threshermen.

By degrees they evolved what we know as the "combine." It was primarily dedicated to the limitless, fairly level lands of the Great Plains, making it possible to cut wheat at the right stage, scores of acres daily, thresh it right on the traveling outfit with power take-off arrangements, elevate it into attached bulk trucks, and haul it to market quickly. In a few years this invention was modified and adapted to the smaller, rolling farms of the humid regions—where most of the cereals raised are put into livestock rations.

It has been truly observed that each new advance we make presents new difficulties in some related direction. Just so with the coming of the combine and the rapid transportation of the quickly cut wheat to commercial storages.

TODAY when we say that the "wheat harvest has begun" we snap a signal to all the intricate chain of agencies which receive it on its road to processing or export. There is no longer any breathing spell reserved for the curing and threshing tasks. Immediate de-

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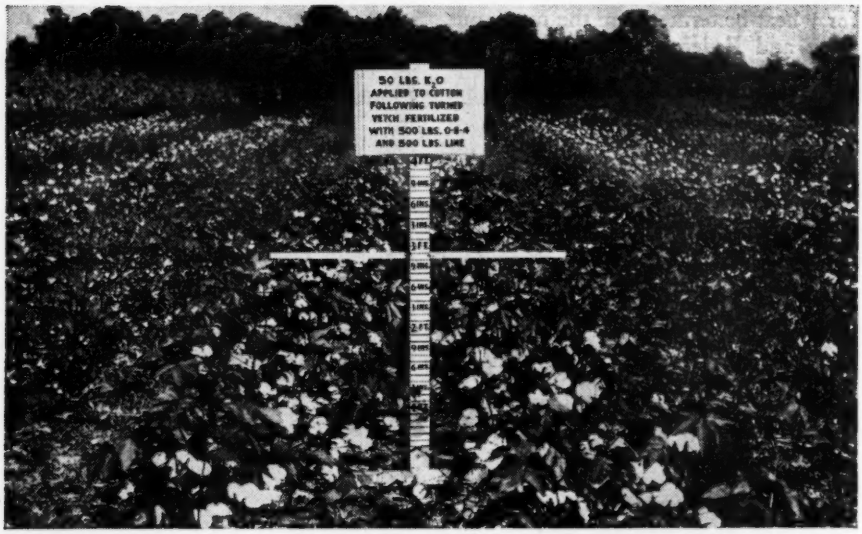

Fig. 1. This excellent photograph of a fertilizer test plot demonstrates several things. The sign is attached to a portable stand. The cross bar is adjustable to indicate the height of the plants on either side. Note the neat, black lettering on a white background.

Some Photographic Hints For Agricultural Workers

By Ross E. Hutchins

Mississippi Agricultural Experiment Station, State College, Mississippi

PHOTOGRAPHS are playing an ever-increasing role in the modern world. The past 20 years have seen tremendous advances in the science of photography and more are around the corner. There are new films of greater speed and greater versatility, practical color processes that almost any one can use, new and better equipment that would make an old-time photographer green with envy. Pick up any magazine or technical journal and you will realize the part that good pictures play in presenting information. Visual means of education are being utilized more and more in nearly every school and college. The agricultural worker, whether he be in research or in extension work, can and should employ pictures to record the results of his experiments and to present his information to the public.

It goes without saying that every agricultural worker should have some knowledge of photography. This is desirable even though he has a pro-

fessional photographer to actually take his pictures. Photography has, like everything else, its limitations and special requirements, and the worker should understand these things in order to plan his methods of presentation. Very often a photographer is called upon to make a picture that could have been portrayed much more effectively had the agricultural worker known something about the technical side of photography.

The science and art of photography are complex in the extreme, yet for the ordinary work of making pictures only a few fundamental principles need to be understood. Most agricultural photography is relatively simple, but in the first place a good camera is an absolute necessity. One cannot expect professional results from inferior equipment. Neither can one expect professional results from expensive equipment in the hands of an inexperienced worker. All too often an expensive camera is purchased in the hope that good equipment will compensate for lack of knowledge. Such a belief is very erroneous. If you know nothing about photography and are not willing to learn a few of the simple fundamentals of the subject, the best thing to do is to purchase a simple, inexpensive camera. Your percentage of good pictures will be higher. Remember that an expensive camera with all its gadgets is capable of making excellent pictures, but only if it is properly used.

Selecting the Camera

This is a difficult subject and one that usually causes considerable concern. The agricultural worker must have a camera that is capable of producing negatives that may be enlarged up to 5 x 7 inches and still show adequate detail. This is necessary for publication, for most magazines and papers require a picture that large or preferably 8 x 10 inches. A poor lens will not give such a picture. Photographic equipment is expensive and the camera lens is the most expensive single item. But a camera is only as good as its lens. If you know nothing about lenses, seek the advice of a photographer or a reliable dealer. More than likely the camera you buy already will be equipped with a lens and you will not have any choice in the matter. Most good cameras are fitted with good lenses.

Before we talk about cameras, it might be well to consider prices. The writer once was advising a prospective camera purchaser, and in reply to the question, "How much do you wish to pay?" the answer was, "I want to get a good camera and I wouldn't mind paying as high as $15." This man was an optimist. Cameras can be obtained for that price, but they will not produce pictures adequate for publication. To obtain pictures of the type the agricultural worker needs he must pay at least $50 and probably as much as $200 for a camera.

It is impossible in the space avail-

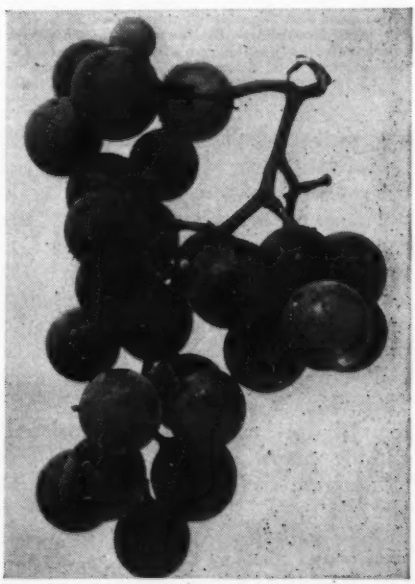

Fig. 2. The problem of photographing an object so that no shadows are visible is one that the agricultural worker often encounters. In this case it was solved by placing the grapes upon a plate of glass elevated several inches above a white background.

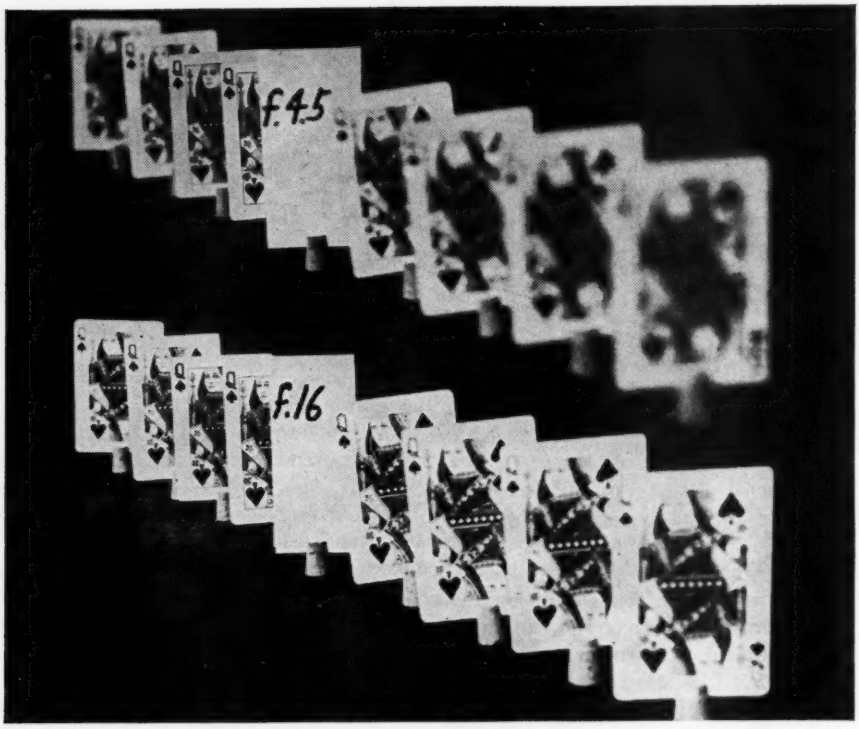

Fig. 3. Depth of field demonstration. In the upper row of cards the camera was focused on the white card and the diaphragm was set at f. 4.5. Note that only the white card and one or two playing cards beyond are in sharp focus. In other words, the "depth of field" is very shallow. In the lower row the diaphragm was closed to f. 16 with the result that the depth of field was greatly increased. This simple experiment demonstrates clearly the value of using a small diaphragm opening whether it be for a field scene or a close-up of an ear of corn.

able to discuss all the various kinds of cameras. Either the roll film type or the cut film and film pack type may be used. The latter are best but are usually more expensive. The size is important. The camera should be at least 3¼ x 4¼ inches. Press photographers use 4 x 5 inch cameras of the press type. The Speed Graphic is a good example of the latter. The small 35 millimeter cameras are of little value for this work except for making kodachrome slides. These, however, certainly have their place in agricultural work.

A ground glass is usually a necessity if any photographs are to be made of close-up subjects such as potted plants. If the only camera available has no ground glass, it is still possible to make close-ups by means of supplementary lenses. These are usually called portrait lenses and are nothing more nor less than spectacle lenses mounted in a ring that slips over the camera lens. When the camera is focused at infinity, each portrait lens will bring the focus up to a certain point depending upon the power of the lens. All one has to do then is to measure the distance from the lens to the subject. It is a necessity that the diaphragm or stop be closed down a great deal for close-up shots because the depth of field is very narrow. If much depth is needed, the diaphragm setting should be about f. 22. Depth of field will be discussed later on.

If no regular portrait lenses are available, they may easily be made of lenses from 10-cent store spectacles. When cheap spectacles are sold, there is a

small disc of paper attached to the lenses bearing a number. This number indicates the power of the lens in dioptres. Now a lens of a given dioptre will always bring the focus up to a certain point when the camera is focused at infinity. For instance, if a spectacle lens of three dioptres is placed over your camera lens with the camera at 100 feet or infinity, the focus will be brought up to 13 inches. This is very useful to know. The following table shows various dioptre powers and the focal distances they give:

Spectacle Lens Dioptre	*Focal Distance*
.5	6½ feet
1	39 inches
1.25	31½ "
1.5	26 "
2	20 "
3	13 "

The spectacle lens should be mounted as close to the camera lens as possible. This may be done with a short section of cardboard tube. To get good pictures by this means some method of holding the camera rigid, such as a tripod, is necessary. Also to compensate for the close-up a good deal of increase in exposure time is necessary. This needs to be only approximate as modern film has a great deal of tolerance. For the one dioptre lens, increase exposure about four times and for the three dioptre lens increase it ten times.

Depth of Field

This is one of the most important things in photography and one that is not fully understood by many who take pictures. Suppose you are photographing a field of oats having a sign in the foreground indicating the variety or amount and kind of fertilizer used. How will you photograph the subject so that both the field and the sign will be in sharp focus? There is only one way to do this. Close the diaphragm down to about f. 16 or f. 22 and make appropriate time settings. Remember this: *You can have either great depth of field or great speed*—you cannot have both. You must decide which is the more important for the subject you are shooting. For the oat field we have seen that depth was paramount. Now suppose we are photographing a bunch of horses galloping across a pasture. In this case, speed to stop the action is important, and so we sacrifice depth and open the diaphragm to, say, f. 6.3 and

Fig. 4. An excellent means of portraying graphically the differences in yield.

cut down the time to about one two-hundredths of a second.

There is another way in which a knowledge of field depth may come in handy. Often certain subjects stand out better if the background is out of focus, thus emphasizing the subject. In this case open up the diaphragm and increase the shutter speed appropriately.

Exposure

Exposure is a subject that always causes a great deal of concern and doubt. If you can afford it, obtain one of the several electric exposure meters that are on the market. They will take a lot of guess work out of the question, but only if properly used. Point the meter at the subject being photographed—not at the sky. You are not trying to photograph the sky. Take several readings of various parts of the subject and average them. Film speed varies considerably, therefore always set the meter for whatever film you are using. Do not point your meter directly at the sun as this will harm it. Do not carry it in the hot glove compartment of your car. Study the directions that come with it and follow them closely.

If you cannot afford an electric exposure meter, then obtain a kodaguide from your dealer. These are small plastic calculators which cost only a few cents and with careful use will give excellent results.

Now one final word about exposure. Unless absolutely necessary take no pictures on dull, cloudy days unless you are photographing close-ups and using flash bulbs or other lights. Pictures taken on dull days usually look dull. If you want pictures with sharp detail and snap to them, use bright sunshine. There is one exception. Sometimes light clouds actually help color pictures. Remember, however, that in this case the color is giving you the detail and not the light and shadow as in black and white photography. If you have no meter, give one-fiftieth second at f. 16 in bright sun and you will usually get good pictures.

Some Rules and Suggestions for Agricultural Photography

1. Take care in the preparation of your subject. More than likely the photograph will be published. At least

(*Turn to page* 44)

Fig. 5. A field scene having great depth. A small diaphragm opening was employed so that everything is in sharp focus from the grass in the foreground to the trees in the distance.

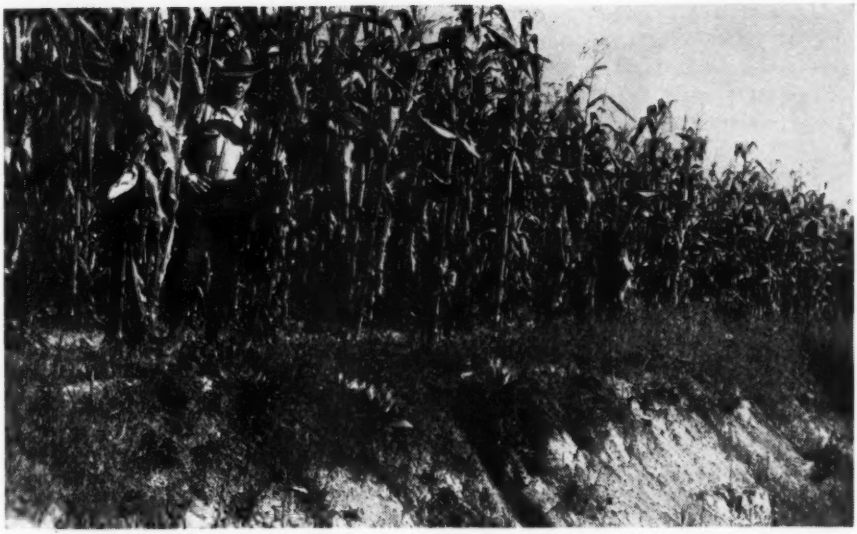

Fig. 1. Productive soil and an adapted hybrid help, but do not assure, good corn yields.

Heredity Plus Environment Equal A Corn Crop

By L. L. Huber

Agronomy Department, Pennsylvania State College, State College, Pennsylvania

A CORN crop, good or poor, results from a combination of factors, partly hereditary and partly environmental. If a corn hybrid is truly adapted to a certain locality, it has good heredity as far as that vicinity is concerned. For the moment, let us consider all problems of corn heredity as solved by plant breeders—although of course they are not—and ponder what often happens to the environment, the fields, in which corn is grown.

Corn happens to be one of a succession of crop plants which will grow, let us say, in a certain field. If corn is grown after corn repeatedly (and no fertilizer is applied), eventually corn will not succeed in that area. Some other crop must be planted or weeds will take over.

This principle of succession of plants may be illustrated by reference to an old glacial lake near my former home. This lake is gradually filling up with organic matter. If one were to take a boat on this lake, he would observe in approaching the shore thousands of submerged water weeds with stems 10

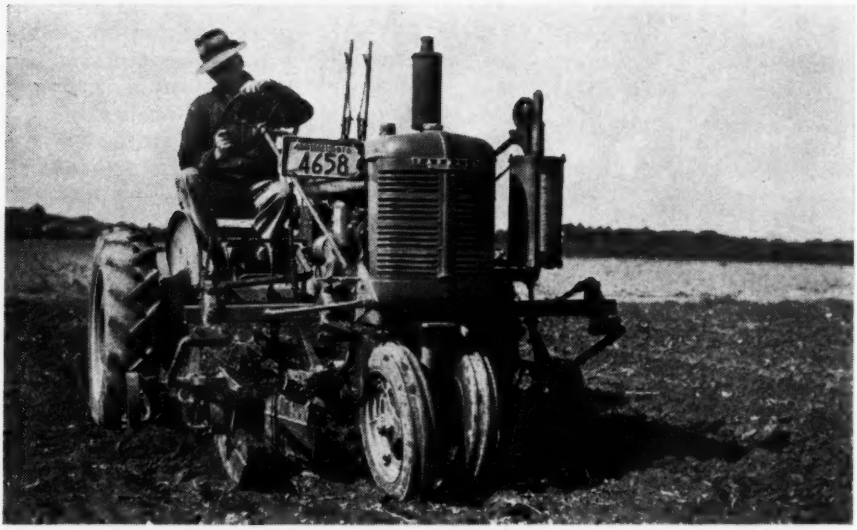

Fig. 2. Heavy machinery compacts soil and lowers permeability. Careless cultivation prunes roots and destroys corn plants.

to 15 feet long. As these plants grow and decay, the water becomes shallower until in the end it is too shallow for them to endure. They can't grow in shallow water.

A little nearer to the shore water lilies begin to appear. They in turn grow and die down and fill their section of the lake. Nearer shore where the water has become too shallow for water lilies, cattails have appeared which in turn grow and die and thus help to fill up the lake. And beyond the cattails are the sedges; they are so close to the water's edge that they are submerged only in spring. Here at the water's edge, willows have begun to thrive. Back of the willows come cottonwoods with oaks and hardwood trees farther up on the higher land. In the end, hardwoods will cover the whole lake area.

One point of importance here is that in this succession, one species of plants gradually creates an environment more and more unfit for itself but more fit for something else. Almost within the memory of living man, a similar succession of plants has occurred in some of our farming areas. Settlers cleared the land and cropped it with corn and wheat, later perhaps to rye, and then to buckwheat. Who wants to grow buckwheat? Only he whose land will profitably support no other crop. Eventually the land has gone out of production, even of buckwheat, and coarse poverty grasses have taken over. In some instances, the poverty grass stage has been relatively short. Pines, such as Virginia pine, already have come in and natural reforestation has started again.

Crop rotation is man-made and man-regulated plant succession. Crop plants are subjected to the immediate action of their environment, the plants in turn having a marked effect on this environment. The whole problem of soil management and cultural practice largely roots in this relationship. It is our job to regulate crop succession to our advantage.

While plants are dependent upon environment, man is dependent upon plants for his food supply; hence, his most striking relationships are with plants. His problem is concerned with how to obtain the most from plants. A satisfactory crop rotation or plant succession is a triumph in man's attempt to gear his problem of food and

shelter into the pattern set up by Nature.

Man and Nature may be mutually helpful or they may be antagonistic. Plants have shown us that if we are to be their master we must understand how to handle and regulate them. Unless we give thought to what we do, we may unwittingly create an environment which is more and more unfit for the crop that we want and more fit for one we do not want to grow.

How often have you seen corn following corn on the same field, year after year; or corn following soybeans; or soybeans following corn? What sort of environmental change is set in motion with this kind of practice? The ground is left bare each fall; perhaps the stalks are burned in the spring. Plant residues often are kept at a minimum.

The accumulation of humus is a universal process of nature. Any practice that interferes with the maintenance of organic matter in the soil is one which calls for attention. With decline in organic matter, aeration of the soil is decreased. Earthworms, soil insects, bacteria, and fungi are reduced in quantity, thus further decreasing aeration. Proper tilth disappears. The soil becomes hard. Erosion is increased because poor soil structure has been allowed to develop. Use of heavy farm equipment year after year through further compaction of already hard soil adds to the difficulties of growing crops.

This description shows how a single farm practice may set in motion a whole chain of events, many of which may not be predictable. It is evident that we can not safely ignore nature's laws. Good corn crops don't just happen. An understanding of the relation of the corn plant to its environment is essential. How the corn plant performs is determined by its environment.

Environment, however, is more than soil. We may have a soil that is relatively high in organic matter, well aerated, rich in bacteria and fungi, adequately limed, well drained, and well supplied with nutrients, but we still may fail to produce a good corn crop. We must have the cooperation of the weather.

There is no substitute for adequate rainfall, favorable temperature, and plenty of sunshine. Whenever the soil moisture exceeds certain minimum and maximum proportions, the corn plant ceases to function to our advantage. The deleterious effect of drouth, however, is partly offset when soil is high in organic matter. Abnormally high rainfall on compacted soil or soil of poor structure is more damaging than on soil in good condition.

In addition to the soil and weather, the corn plant is subject to important indirect environmental factors; in fact, these indirect factors at times may be more serious than the major ones. For example, suppose a farmer has included

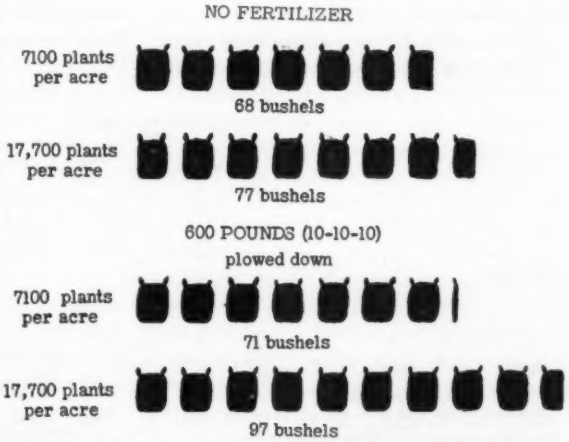

Fig. 3. With the larger number of corn plants (above) the yield improved moderately. When fertilizer was applied (below), this increase was sharp. Improved environment allowed the heredity of the corn to express itself.

sweet clover in his crop rotation; his soil is well drained; temperature and rainfall are adequate. His corn crop is growing vigorously; thus, it is more acceptable to the nutritive requirements of the corn borer—assuming of course that the corn borer is a major hazard in the environment. Such corn will receive a higher egg deposition by borer moths and will favor a higher survival of larvae. There is then a chance that the loss through borer damage would partly or completely offset the gains of added fertility.

Obviously nature is complex. One factor in crop production is associated with others. Furthermore, change is not always in the direction of increased yields.

We must remember, too, that the rotation that we employ and the crop we use are limited by environment. Not every farm or field will produce corn economically. Fundamentally the growth and functioning of the corn plant always depend upon the nature of the total environment and its adjustment to it and not on cultural practices. Cultural practices only modify the relation of the plant to the environmental complex. What man calls agriculture is, in a large measure, the creation of an environment more or less suitable to crop plants.

Now, after having considered some of the problems of corn environment, let us return to corn heredity. Plant breeding has resulted in greatly improved strains of corn. Hybrids which are more efficient in their use of nutrients have been created. They are more resistant to insects and disease, to drought and cold. They give a greater return of high quality corn per acre in relation to cost and ease of production. They are better adapted to the needs of the grower. The use of an adapted hybrid, one that fits the particular environment in a given field, can generally be counted upon to increase yields 25 per cent above those of open-pollinated varieties.

Unfortunately farmers do not always buy and use adapted hybrids; their choices often do not fit or only partly fit their farm conditions. A common mistake is to use a hybrid that is too late to insure maturity even in average years. Thousands of farmers sit on the anxious seat in September hoping for late frost. Year after year, like schoolboys watching a foot race, they hope for a photo finish. Soft corn often results.

"Adaptation" includes more than meeting the requirements of length of growing season. In areas where stalk rot is an important disease, a hybrid can not be considered adapted if it is susceptible to stalk rot. There are areas where the corn borer and the

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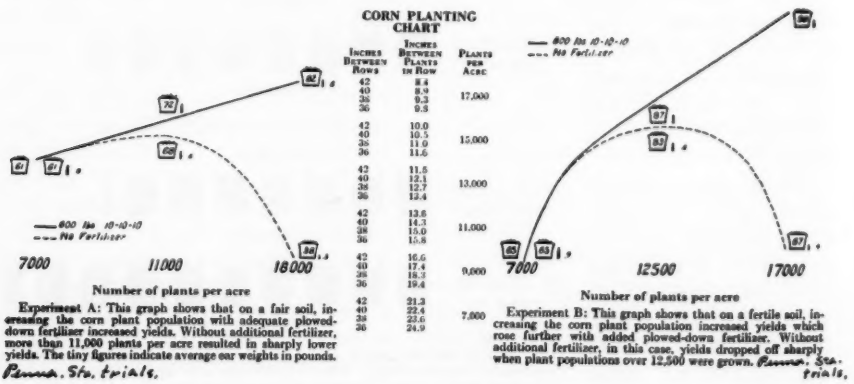

Fig. 4. A Corn Planting Chart.

The Search for Truth

By Firman E. Bear

Soils Department, Rutgers University, New Brunswick, New Jersey

ON the 24th day of May, 406 years ago, an old man, long confined to his bed by paralysis, awoke to find a messenger, with a book, standing by his bed. He reached out, grasped the book, eagerly scanned the title page, smiled happily, and fell back—dead. That man was Copernicus. The book was his "De Revolutionibus Orbium Coelestium." It contained the mathematical proof that the earth revolves around the sun, a discovery that was to start man on his first systematic search for truth.

To say that the sun was more important than the earth was heresy in Copernicus' day. For the system of learning of that time was based on the doctrines of Aristotle who taught that man was the center of the universe. To doubt that publicly meant to die an unnatural death.

Aristotle had assembled more knowledge than had ever before been compassed by one mind. He had surveyed the whole realm of thought and had written 400 books. But he had never stopped to test his conclusions by experiment. He reasoned so skillfully that one wonders how he could possibly have come to the conclusion, as he did, that human beings have only 16 ribs and that women have less teeth than men.

But Aristotle can easily be forgiven his mistakes when one remembers that he had no telescope to turn upon the heavens and no microscope to turn upon life. He had no watch, no thermometer, no barometer. And, except for the mathematics of Pythagoras and a few minor bits of experimental data, there were no proven facts.

There had been some wise speculations. But since they *were* speculations, Aristotle believed, quite humanly, that his were more dependable. He formulated a whole new philosophy of his own. Though the belief that the sun and the planets were not handmaidens of the earth had been suggested by Plato, his teacher, Aristotle would not permit his followers to stoop to so degrading a thought.

Yet Aristotle laid the foundation for science by organizing the existing knowledge of the world and teaching men to think. Out of their thinking came *doubt*. And doubt is a potent force that rudely pushes ignorance aside and cuts new channels for thought.

It was doubt that made Novara check Ptolemy's astronomical calculations. As a result he noted discrepancies, which he confided, behind tightly closed doors, to his pupil, Copernicus. It was doubt that led Copernicus to devote night after night and year after year in plotting the movements of the stars. And the data he collected, added to the calculations of Kepler and the experiments of Galileo, not only yielded the knowledge that the sun was the center of our solar system, but opened the door to still greater truths that lay ahead.

It was doubt that sent young Galileo to the top of the Tower of Pisa to drop his weights, a heavy and a light one. Aristotle had speculated that a heavy weight would hit the ground before a light one, and his verbal proofs were so convincing that no one had dared to doubt it. But when Galileo's weights banged on the pavement simultaneously, they started reverberations that

were heard round the world, and they have been echoing down through the centuries ever since.

Galileo put all beliefs, including his own, to experimental tests. To test the Copernican theory he needed some device by which he would see the heavens better. So he read up on optics, designed a three-power telescope, enlarged it to a 30-power one, and saw, with his own eyes, what Copernicus had said man would see if his vision could be sufficiently enhanced.

The Senators of Venice were so intrigued by this instrument, which brought their ships into view two hours before they could be seen with the naked eye, that they raised Galileo's salary and made his job good for life. But Galileo's experiments were so devastating to the opinions of the professors of his day that they finally rose up in resentment against him and caused him to be called before the Inquisition in Rome. Galileo would have gone to the stake, had he not recanted his too-modern beliefs. As it was, he spent the last days of his life a prisoner. But that did not prevent his recording the results of his experiments and formulating laws of motion that have survived the test of time.

The year before Galileo died, an English farm boy was born who was to pick up the torch of truth and carry it on for his generation. That boy grew up to be the great Isaac Newton. By the time he was 24 years of age, Newton had laid the foundations for differential calculus, he had formulated the laws of gravitation, and he had unlocked the door to the secrets of the spectrum. But, after some unfortunate early experiences in trying to enlighten the Royal Society of England, he didn't tell anybody about his discoveries. In fact, the minds of most of the men about him were so cluttered up with impossible notions about the world in which they lived that no useful purpose would have been served by revealing his thoughts to them.

Newton's laws on gravitation had been gathering dust for nearly a generation when Picard, a Frenchman, found that a degree was nearly 10 miles longer than it had previously been believed. That was all Newton needed to make his calculations check. For the next two years he was lost in celestial mathematics. Sometimes he would sit on his bed, only half dressed, the whole day long. He never knew whether he had eaten or not. And, for weeks at a time, he never left the house. He was writing his Principia, the most famous scientific treatise of all time.

Strange as it may now seem, much more thought had been given to the universe than to the world in which men lived. The thoughts of the early philosophers and scientists were on the heavens rather than on the earth. They knew little of the air they breathed, the ground they walked on, the food they ate, and the life that throbbed within themselves. The eighteenth century was at hand, yet men knew literally nothing about the things that were closest to them.

For centuries, the alchemists had been so engrossed in their search for means by which the baser metals could be transformed into gold that most of them had lost sight of the real values of that day. But a few masterminds had turned their efforts toward the earth beneath their feet and the life that continued to grow out of it. One of them, Robert Boyle, was pulling substances to pieces, for no other reason than to find out how they were made. When he got them reduced to their component parts, he called these parts elements, and a new science, chemistry, was born.

Of all the mysteries of all time, the greatest was the phenomenon of fire. All that men knew about fire was that it never occurred except in the presence of air. Boyle discovered that air was a mixture of gases, but he could not separate them. Priestley had isolated oxygen, but he had no conception of its relation to combustion. Fire was some-

thing called Phlogiston that escaped into the air when a substance was burned. And that was less than 200 years ago.

The world had to wait for the great French chemist, Lavoisier, to solve this age-old riddle. Wealthy enough to lead a life of ease, this tireless man was one of the most active scientists the world has ever known. He never allowed himself the luxury of a leisurely meal. For long stretches, to save time, he lived on bread and milk alone.

With Lavoisier, accuracy came into the chemical picture. He designed the analytical balance, a veritable sword of truth. He weighed substances before they were burned and the residues that remained. He found that sulfur and phosphorus added weight, but that the air around them lost an identical amount in the process. Soon he had pieced together the fundamental law of the indestructibility of matter, that nothing is actually gained or lost when chemical processes take place.

For 20 centuries it had been believed that water, on boiling, turned to stone. That explained the deposit in the bottom of the teakettle. Lavoisier doubted this. For 100 days and 100 nights, he distilled and redistilled pure rain water, never letting the flame go out. Yet at the end of that time he had only a mere speck of solid matter remaining in the bottom of his flask, and this his balance accounted for in the loss in weight in the flask itself.

Once again the ugly head of ignorance and prejudice raised its head to crush an amazing truth to earth. Incited by jealousy and by their inability to comprehend the workings of this pioneering mind, his fellow scientists incited action against Lavoisier. Suddenly, one day, the door of his laboratory was burst open and soldiers came pouring in to the sound of crashing glass. Shortly afterward the head that had done so much to advance the truth in France fell under the guillotine.

But Theodore de Saussure, then 27 years of age, was standing by, ready to take up, immediately, where Lavoisier had left off. His scientific interest went back to his grandfather, who was forever writing papers for the local agricultural society. This inquisitive old man possessed a lot of practical knowledge of the means by which crop yields could be increased. He knew, for example, that manure, bones, and wood ashes stimulated plant growth, that lime cured sour soils, and that legumes improved the land, and he was annoyed that he didn't know why. But young de Saussure burned plants, analyzed their ashes, and made the important discovery that soil is a necessary constituent of living things.

But it was not until young Jean Boussingault, then a mere two-year-old, who was being brought up among ragpickers on a dark, narrow street in Paris, had grown to manhood that anyone was to see the real significance of de Saussure's work. Somehow, Boussingault rose above his surroundings, grew to be a chemist, became interested in agriculture, married a farmer's daughter, and began experimental work with plants on his father-in-law's farm. There he put laboratory experiments to field test. He kept a record of the intake and outgo of elements from the soil by way of the crop. He analyzed the soil, the crop that came off it, and the manure that went back onto it.

And yet another mastermind was in the making in Justus von Liebig, a brilliant young German, who had wedged his way into Gay Lussac's laboratory in the Sorbonne in Paris. There he was soon so impressed with the superiority of the laboratory over the lecture room as a means of learning that he resolved to have a laboratory of his own at the first opportunity. And that was not far ahead for, by 1840, Liebig's laboratory at Giessen had become the world center for students of plant and animal nutrition. Out of the work in his laboratory came the first clear-cut analysis of soil-plant-atmosphere relationships. It was Liebig who first enunciated the

law that plants create organic matter out of purely inorganic substances, a thing that animals are incapable of doing.

A copy of Liebig's book fell into the hands of young John Lawes who had just come into possession of his ancestral estate at Rothamsted, England. As Lawes read the book he quickly became intrigued by the idea that crop yields could be increased at will, merely by adding a few minerals to the soil on which the crops were to be grown. Lawes was quick to see the possibility of an artificial manure industry that might well assume large proportions if Liebig was correct. A commercially-minded man, he set to work immediately to cash in on this idea.

But first he had to find out the exact effects of chemicals on soils and crops. He began by employing Henry Gilbert, the best chemist he could find. He set aside a whole field, and later a whole farm, for experimental work. There, over 100 years ago, Lawes carefully laid out what is now the oldest set of fertilizer plots in existence, and he seeded them to wheat. And wheat has been planted in them every year since.

Three men were now the center of a controversy that was to continue with increasing intensity for half a century. This controversy had to do with the source of the nitrogen of plants. Liebig, the theoretical chemist, said that plants got their nitrogen from the ammonia of the air, which comes down in the rainfall, but he didn't take time off to prove it. Lawes, the commercial chemist, caught some of the rainwater that fell on Rothamsted, analyzed it, and found that the quantity of nitrogen thus supplied to an acre of land was only a small fraction of what a good-sized crop required. But Boussingault, the farmer-chemist, analyzed his soils, the manures that were applied to them, and the crops that were removed from them and found more nitrogen than he could account for.

Over in America, W. O. Atwater, of the Connecticut Agricultural Experiment Station, began working on this problem. But the real answer escaped him, as it had all those before him. It was not until 1886, over a decade after Liebig had died and in the last year of Boussingault's life, that Hellriegel, a German chemist, startled a group of his associates with the announcement of his discovery of the nitrogen-fixing powers of the bacteria that live in the nodules on the roots of legumes. When the full significance of this discovery dawned on the chemists of that day, they realized that an entirely new science, bacteriology, had come to their aid.

Leeuwenhoek, a Dutchman, had glimpsed the microbial universe in the seventeenth century, by the use of his new invention, the microscope. De Saussure had discovered the manner in which microorganisms multiply. Spallanzani had collected convincing evidence that the vibrant life which he saw with the lens played a mysterious part in the processes of Nature. Then came Pasteur, the Magellan of the microbe world.

Previously a chemist, Pasteur had turned bacteriologist quite by accident when the distillers who operated plants near his laboratory brought their troubles to his door. Sometimes their mash produced alcohol, but often it yielded acid instead. Accustomed to examining crystals under a lens, Pasteur, not knowing what else to do, put some of the mash under the microscope. To his surprise, two different kinds of living things came into view. One of them proved to be a budding yeast, and the other a rod-shaped bacterium. A whole new world opened up before him—a teeming, previously unseen world of living plants and animals, all ceaselessly working for man, or perhaps against him.

From that day on, Pasteur was lost in a new field of exploration that was to lead him from one trouble to the next, in quick succession, until he was dealing with the most dangerous dis-

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Recommended Practices For Growing Peanuts

By B. E. Grant

County Agent, Windsor, North Carolina

THE war years were a time of expansion of food and feed crops. Farmers were requested to produce the maximum amount of many of these crops so that there would be ample food for our fighting forces, our allies, and those engaged in the manufacture of war supplies.

Peanut farmers were requested to *greatly* expand production. We were told that food would win the war and write the peace. We realized at the time that many peanut farmers were already growing peanuts on their land more often than they should, but we also realized that our country could not afford to lose the war. As a result we planted peanuts on land where they should not have been planted.

We are now embarking on a period of readjustment; and in order to bring the supply more nearly in line with anticipated demand, we have acreage control again this year. However, the quota program on peanuts is on acreage, as it is with tobacco, and not on total production. We have seen how tobacco farmers have increased their yields per acre since quotas were established through the adoption of practices that give higher yields per acre. To some extent peanut farmers can accomplish similar results, although peanuts do not respond to direct applications of fertilizer in the same way that tobacco, corn, and cotton do. Yet they are heavy feeders on mineral plant foods such as phosphorus, potash, and lime. In this respect, farmers have often referred to them as a very peculiar crop.

Since peanuts cannot be depended on to respond uniformly to direct applications of fertilizer, even though they use considerable amounts of plant food in producing a good crop, it is of great importance to follow a system of farming in which the soil fertility is maintained. This can be accomplished through the use of soil-conserving crops and a rotation that keeps up the organic matter in the soil, with adequate lime, phosphate, and potash used for the crops in the rotation that precede peanuts so that there will be plenty of plant food left over. Peanuts have been referred to as a scavenger crop

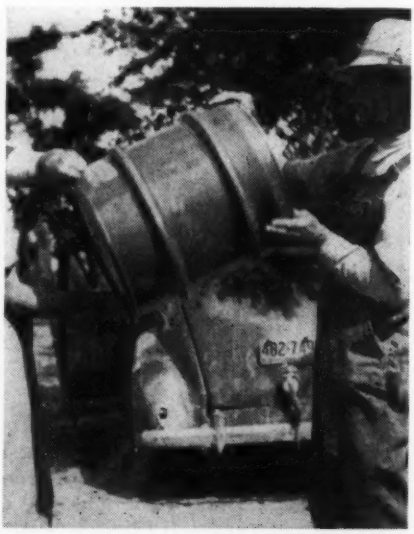

Fig. 1. Treating seed peanuts with Arasan helps to insure a better stand.

with the ability to take up plant food left in the soil from other crops.

While a considerable acreage of peanuts has been grown on the same land two or more years in succession, this is not a good farm practice. Even though a large per cent of the crop is grown in a 2-year rotation, this is not considered the best rotation. Some of the better farmers have found that it pays them to follow a 3-year rotation. The problem on many farms is to adjust operations so this can be done, and the reduction in acreage and increased interest in livestock will enable more farmers to follow such a rotation.

In addition to maintaining the fertility of the soil through a better crop rotation and use of soil-conserving crops, it is important to maintain a satisfactory pH in the soil with calcium and magnesium. The pH refers to the relative acidity of the soil, which is determined by soil test. A pH of 6 or slightly above appears to be about right for peanuts.

According to the North Carolina Agricultural Experiment Station, it is necessary to have available calcium in the row when the peanuts are making in order for them to develop a normal crop. For this reason land plaster is applied on the plants in July. Land plaster contains calcium sulphate which has a neutral effect on the soil. In a test conducted in 1948 by the Experiment Station on W. L. Powell's farm in Bertie County a yield of 1,242 pounds of nuts was made where no lime or plaster was used. Plaster alone increased the yield to 1,784 pounds. Dolomitic lime alone gave slightly less results than plaster but a combination of the two gave a higher yield than either used alone. In this case a further increase was obtained from 40 pounds of actual potash on the row. The Experiment Station reports that it is not unusual to get an increase from potash on potash-deficient soils.

While peanuts need lime, we should bear in mind that too much lime can be used. Several fields were found last summer where the growth of the peanuts was stunted and the yield reduced. A soil test on many of these fields showed that too much lime had been used. The State Department of Agriculture maintains a Soil-testing Laboratory and makes no charge for testing soil samples from North Carolina farmers. An increasing number of farmers are taking advantage of this service.

It has been said that a well-prepared seedbed is half of the cultivation of a crop. Peanuts are no exception to this rule.

In planting-date experiments conducted by the North Carolina Station, early planting usually gave higher yields than medium or late planting. While it is important to treat all peanut seed with Arasan before planting, it appears to be even more important with early planting since the Arasan used in the seed treatments helps to prevent the peanuts from rotting in cold soil and helps to get a better stand.

Spacing tests have in instances given as much as 1,000 pounds difference in yield between thick spacing and the normal spacing practiced by farmers. In row spacing and thickness in the row experiments conducted by the Experiment Station in 1948 on peanut farms in the peanut belt of northeastern North Carolina, the average of 4-, 8-, and 12-inch spacing in the row on Norfolk sandy loam soil of the William Charles farm at Ahoskie was 2,683 pounds per acre with 36-inch rows. With 27-inch rows the average of the same spacings in the row was 3,205 pounds. With 18-inch rows and the same spacing in the row the average yield was 3,963 pounds per acre. Highest yield in this spacing experiment was with 12-inch spacing in the row and with 18-inch rows.

This soil appeared to be somewhat deficient in potash, for in duplicate spacing experiments on this farm where 100 pounds of potash were used as the peanuts were cracking through the soil,

Fig. 2. This grower is planting peanuts and applying fertilizer in bands in one operation.

the yield in the 12-inch spacing in the 18-inch rows was increased from 3,963 pounds to 4,644 pounds, an increase of 681 pounds. The yield of 12-inch spacing in the 27-inch rows was increased from 3,023 pounds to 4,269 by the application of 100 pounds of potash, an increase of 1,246 pounds per acre.

In a similar experiment with Bertie fine sandy loam on Edenhouse farm, the highest yield where no additional potash was used was with a spacing of 4 inches in the row on 36-inch rows. A spacing of 12 inches in the row on 36-inch rows gave a yield of 2,752 pounds, but 4-inch spacing on 36-inch

Fig. 3. Dusting to control disease has resulted in an increase of more than 300 lbs. of nuts per acre.

rows on this farm gave a yield of 3,596 pounds, or an increase of 844 pounds per acre. A topdressing of 100 pounds of potash per acre in this experiment did not consistently give an increase in yield.

In another spacing experiment located on Dunbar fine sandy loam on the Broswell estate at Battleboro with 18-, 27-, and 36-inch rows, where 4- and 8-inch spacing in the rows were compared, highest yield was obtained with 27-inch rows and 4 inches in the drill. This yield was 2,517 pounds. Eight-inch spacing in 36-inch rows gave a yield of 1,960 pounds per acre, or 557 pounds less than 4-inch spacing on 27-inch rows. In the duplicate plots of this experiment where 100 pounds of potash per acre were used, the average yield of all plots was depressed, although there was increase in some of them.

In summarizing the results of these experiments, it appears to be very important to have a good stand of peanuts on the land in order to make the most profitable yield. Most farmers may have some difficulty in cultivating rows as narrow as 18 or 27 inches and it must be remembered that more seed will be required to plant an acre with the thicker spacing. It appears, however, that regardless of the width of rows used farmers might profitably plant their crop 6 to 8 inches in the drill, bearing in mind that a high population of plants is necessary for maximum yield.

Chopping is an expensive item on many peanut farms. The use of a weeder before and after the peanuts come up is advisable. Also advisable are rotary hoes on the cultivator so as to keep down weed growth and reduce the expense for hoe labor. One farmer told us that he did not have to put a hoe in some of his peanut fields where he made liberal use of the weeder and rotary hoe.

Experiments have shown the importance of land plaster to furnish available calcium in the area where the peanuts develop, so it is recommended that 400 pounds per acre be used early in July applied so as to cover the entire width of the row where the peanuts develop.

When disease affects the leaves of a plant, it reduces the ability of the plant to add fruit according to the amount of the leaf area affected. Leaf spot usually starts in a small way on

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Fig. 4. Two rows at a time are being dug with this equipment.

Fig. 1. The original Clover and Prosperity truck which carried the exhibits used at Clover and Prosperity Days, 1923-1926. Standing from left to right are C. E. Carter, Extension Specialist in Field Crops; Miss Fra Clark, Extension Specialist in Home Management; and P. F. Schowengerdt, Extension Specialist in Soils. At most of the Clover and Prosperity Days a separate meeting for the ladies attending was held by an Extension Specialist in Home Economics.

Clover—A Symbol of Prosperity

By N. M. Coleman

Columbia, Missouri

FARMERS of the State of Missouri are using nearly 80 times as much limestone as they did in 1923. The annual use of commercial fertilizers has increased 985 per cent and the acreage of legumes approximately 600 per cent. Much of the credit for these increases must be accorded the Clover and Prosperity Campaign started in 1923 by P. F. Schowengerdt and C. E. Carter, Extension Specialists in Soils and Crops.

To understand the significance of the Clover and Prosperity Campaign, one must have a picture of the time setting. Between 1919-1921, farm income dropped 61 per cent. Because of this low economic level it was imperative that farmers be aroused to the necessity of building up soil fertility by the use of legumes, lime, and fertilizers.

One day as Carter and Schowengerdt were returning from Ohio, they discussed the seriousness of the situation.

"Carter, we're too academic! You go out and advise farmers what crops to grow, and then I follow up and talk about soil. Why can't we go together and help with the over-all plan. We're

like a painter and a paperhanger working on the same room a month apart." Carter nodded agreement, and observed that the most prosperous farms in Ohio grew clover.

"Clover is a symbol," said Schowengerdt, thinking aloud. "It will get them thinking; and if a farmer can do anything in the way of making progress, he is making ground. Yes, I think a Clover and Prosperity Campaign might be worked out."

An idea was born, and the two men were ideally suited to work together on it. Schowengerdt was a man of vision, and Carter had a keen sense of the practical and the impractical. They worked day and night getting the plan down on paper and decided to start the campaign off by designating one special day during the summer to be known as "Clover and Prosperity Day." It was to have something of the Chautauqua, side-show, and the county fair. The first "day" was to be held in St. Francis County.

Difficulty was encountered when the plan was still on paper. They were told that it was not befitting the dignity of the University to resort to circus-like tactics. It was necessary to sell the institution on the idea of propaganda for a purpose before approval was given. The springboard of the campaign would be information gathered over 40 years of experiments at the Experiment Station at Columbia, the oldest field of its kind west of the Mississippi.

Schowengerdt and Carter went to St. Francis County to gather necessary information from Roy Copeland, the County Agent. At first, he was skeptical; nothing like it had ever been done before. However, he soon caught the spirit of the project and agreed to go all-out for Clover and Prosperity Day. He made out a list of prominent farmers, bankers, and business men who were to be asked, even urged, to have a part in the campaign.

The Specialists then stopped at the newspaper office. In a recent interview with Mr. Schowengerdt, he has only praise for the editors over the State. "The campaign could not have been a success without their help. They wrote editorials, they used all the advance material sent out by the College, and they gave front page space for

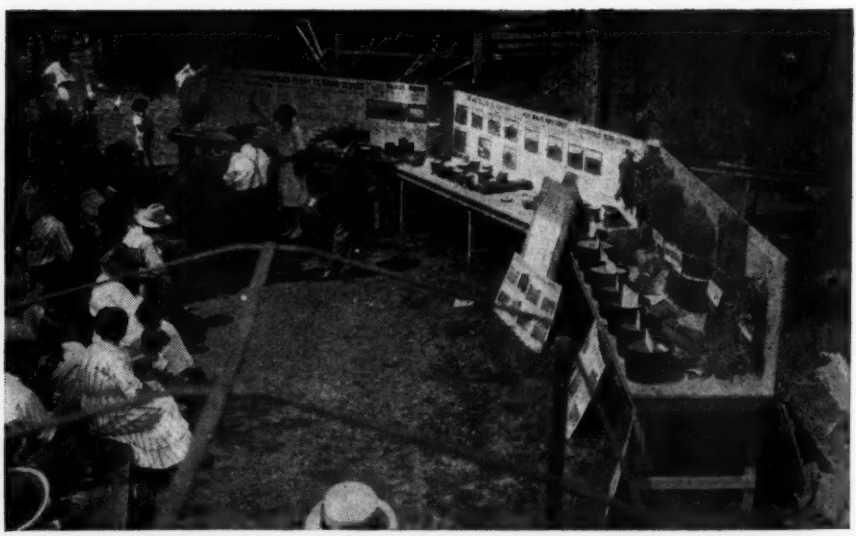

Fig. 2. At most of the Clover and Prosperity Days an essay contest was held on "Why Clover Means Prosperity." This picture shows a contestant reading her essay.

Fig. 3. Prizes were given for the best specimens of legumes exhibited on Clover and Prosperity Day.

'Clover Column,' 'Ask Me Another,' and 'I'll Be There' statements from leaders in the community. It was the editors who got the people out."

From Copeland's list various committees were appointed. There were an Ice Water Committee, Legume Exhibit Committee, Basket Dinner Committee, Grounds Committee, Music Committee, Sticker Committee, and Entertainment Committee. Weeks before the event, four-leaf clover stickers appeared on cars in St. Francis County, and a hundred red arrows pointed the way to the meeting place.

Five thousand people turned out to the St. Francis County Clover and Prosperity Day. The St. Louis Post Dispatch had this to say regarding the meeting. "The messages of C. E. Carter and P. F. Schowengerdt were enthusiastically received. Farmers put aside farm work and declared the coming of the Specialists a holiday. Clover and Prosperity on every farm was adopted as a slogan of the campaign."

The propaganda phase was a success, not only in St. Francis County, but in 12 other counties that first summer. However, the Specialists realized they must further the interest shown by the farmers. There should be more than one gala day in the summer. It was time to stress the educational, and mass adoption phase.

Schowengerdt returned to St. Francis County in November.

"That was a fine turnout for Clover and Prosperity Day, Copeland, but farmers want more than speechmaking. Will you help us plan a Clover and Prosperity Conference, to be held at the courthouse sometime in January? We'd like to have from three to five farmers from each school district appointed as delegates to this meeting, and we'll ask the business men to furnish free lunch for them. It is the aim of the Conference to develop community consciousness relative to the legume problem, locate and develop legume leaders, and create general interest and respect for a new type of demonstration with the view of avoiding mistakes of the past."

"Don't tell me we'll have to tack up another hundred red arrows!"

"I'm afraid so," replied Schowengerdt. "And there'll be more committees and delegates to appoint. You see, Copeland, the Conference is not to be a repetition of Clover and Prosperity Day, but a step in advance toward the development and carrying forward of

a long-time program. I don't think it will be necessary to have another Clover and Prosperity Day; the idea is to make the Conference an outstanding annual affair, activated and developed by the farmers themselves because they see the need for it."

Again the papers and County Agents took it up. Each delegate received an impressive certificate informing him that he had been selected as an outstanding leader in his community. Then he got a letter from banker or business man inviting him to be guest at lunch on Conference Day. To further impress the delegates of the importance of the appointment, their names were prominently displayed in banks, business houses, and newspapers.

Of course, the delegates turned out. It was then that Carter and Schowengerdt used uncanny restraint. They opened that first Conference, a quarter of a century ago, with an informality which seemed almost casual, considering the hours that had been spent getting ready for it. They realized that many of these farmers were suspicious of the white-collared men they had come to hear, and perhaps argue with.

Today that attitude has changed. Farmers of Missouri are eager and ready for technical knowledge, because they no longer have a choice about building up soil fertility.

Schowengerdt usually started the meeting. "Well, what's on your mind? What are your problems?"

"What's all this talk about clover makin' you money?" asked a farmer. He stood up and turned his pocket insideout. "I got forty acres of clover, an' I still ain't got a dime!"

"Clover is good, but it's not the whole picture," Carter explained. "Sweet clover, soybeans, all legumes are needed, each in its proper place."

This started a lively discussion. "I'll grow some sweet clover for you boys, if that's what you want," drawled one of the delegates.

"Why not grow it for yourself?" asked Schowengerdt. "I don't own a farm in this county, and neither does Carter, but *you* do. That's the whole point. Try some of these legumes, and come back next year and tell us about it. Let us hold demonstrations on your land so all can find out what to do about the problems here in this county."

No one had anything to say to this. "Well, if that's the way you feel about it we'd just as well adjourn the meeting. It looks like you're all as prosperous as you want to be."

Talk picked up. "Who has nerve to tackle sweet clover?" Carter asked. Several offered. "Don't say you'll do it on rundown land without proper treatment. It won't grow."

A voice from the back of the room was heard to ask, "What you say we ought to do 'bout it?"

"Schowengerdt and I can advise you, and tell what results they had at the Experiment Station, but unless you work it out on your land, in your county, it won't be of practical use to you."

"I don't need to grow legumes," someone said. "Manure is just as good any day."

"But there's never enough manure."

The meeting lasted until late afternoon, and there was a decided change in the attitude of the delegates. Gone was the I've-farmed-my-land-for-twenty-year-and-nobody's-gonna-tell-me-how-to-run-it look on their faces. Officers were elected, and delegates appointed for the next Conference.

By 1926, Clover and Prosperity Conferences covered half the State. Instead of a small, tarpaulin-covered truck, the College sent out a two-ton truck of exhibits and charts over 4,217 miles of Missouri roads and highways.

Schowengerdt and Carter had addressed a larger number of persons than had ever been reached by two speakers in a similar period in any other agricultural extension project in the United States. Other Specialists were added to the staff to assist in the work.

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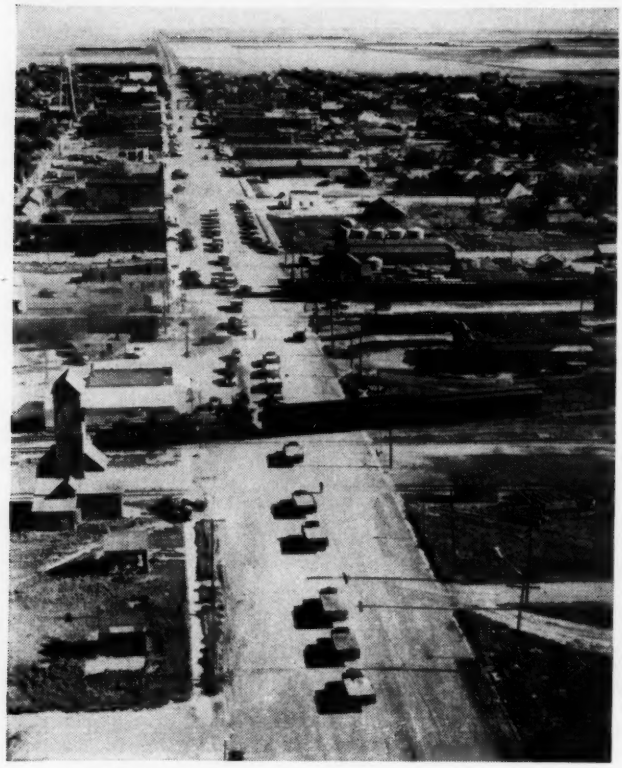
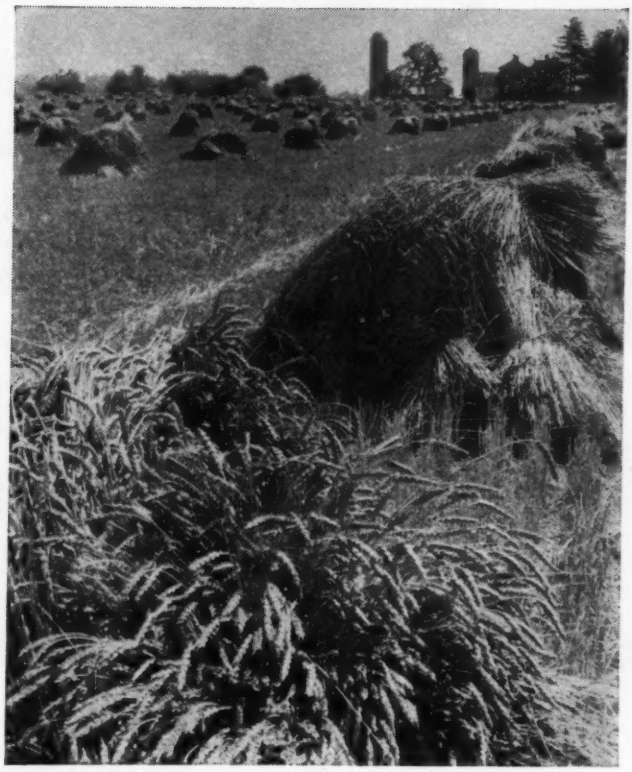
PICTORIAL

Garden Golf



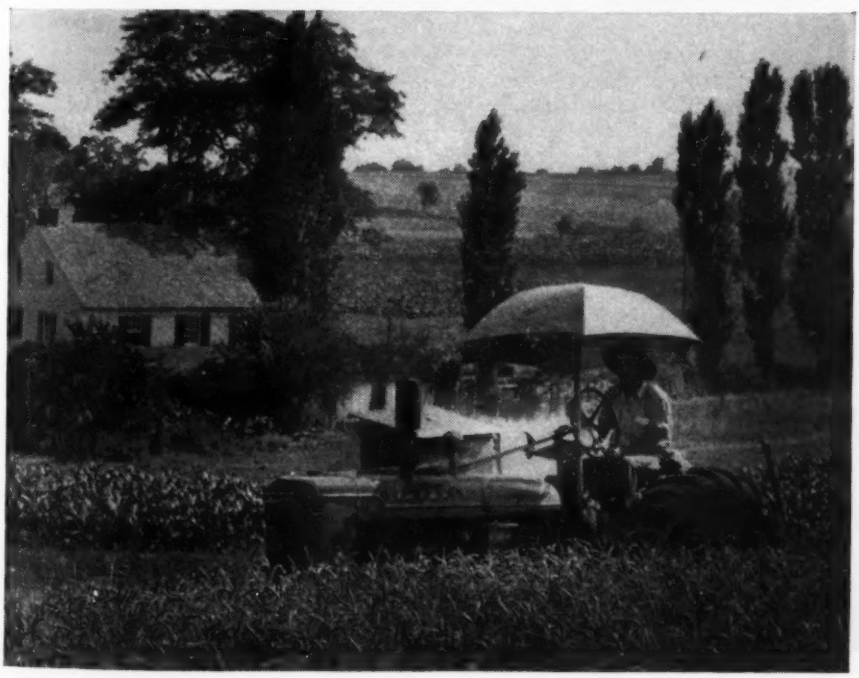
Above: **Combines rolling in one of the big wheat fields in Kansas.**

Left: **Trucks loaded with wheat at standstill in a Kansas town.**



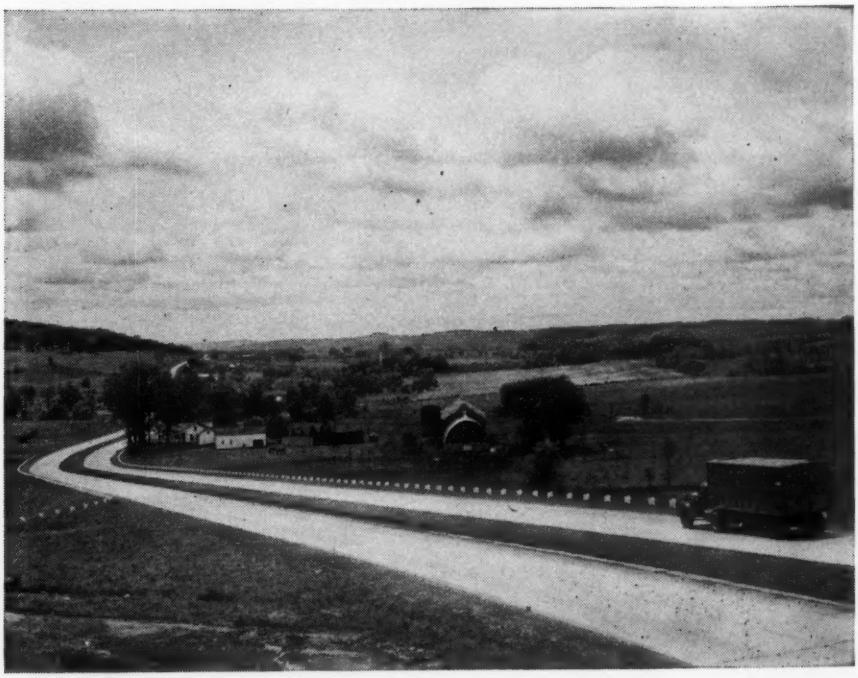
Right: In Indiana, where more of the grain is kept on the farm.

Below: More physical comfort is possible in harvesting smaller acreages.



Above: **Preparation for a long trek to market.**

Below: **On the way!**



The Editors Talk

Review and Outlook

Mid-year is check-up time for the fertilizer industry. In line with this policy, the National Fertilizer Association held its 24th annual convention at White Sulphur Springs, West Virginia, June 13-15, and the American Plant Food Council, its 4th annual at Bretton Woods, New Hampshire, June 19-22. The time at both conventions, exclusive of that spent on association reports, elections for the ensuing year, and recreational features, was devoted to a review of past problems and accomplishments and a look at those to be faced in the future.

Prominent agriculturists from the administrative, teaching, and research fields addressed both conventions. Coming from these talks are many opinions deserving of careful consideration in all agricultural planning. For instance, Dr. W. I. Myers, Dean of the College of Agriculture at Cornell University, is firm in his belief that "no farmer or group of farmers has yet devised a way of increasing farm income by decreasing production" and he emphasizes that "we cannot have a prosperous agriculture unless the rest of the economy—our consumers—are prosperous."

During the present deflationary period he recommends cautious, conservative operation as the soundest policy. The problem, he thinks, is to get an orderly downward readjustment of prices and costs by agriculture and other business to a basis on which the U. S. economy can move ahead with confidence. He lists efficient, low-cost production as the first important factor in the maintenance of farm income. To individual farmers, as to other businessmen, this means reduce cash costs, increase efficiency, and produce products desired by consumers. Involved are increased output per man, higher yields through improved varieties, better use of fertilizers which are still the lowest cost item in farm production, and more efficient methods of insect and disease control.

Dean Myers, in spite of the troubled outlook for the next few years, is optimistic about the long-run prospects for agriculture. To provide 150 million people in the United States with the present per capita diet will take about all that American farms are now producing with no allowance for substantial food exports except moderate amounts of wheat, lard and vegetable oils, and some fruit if Europe can afford it. As population increases during the next 10 years, still higher production will be needed, or more imports, or a less desirable diet. In addition, Western Europe will need large food imports even after full recovery. He explained that the principal way of obtaining increased food production in the next decade is by higher yields from land already in use. "This goal is attainable if vigorous programs of research are continued and if these improved practices are put promptly into use by farmers."

Dr. Robert M. Salter, Chief of the Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, also had something to say about research, particularly concerning optimum rates of fertilizer application under conditions combining the most advanced methods of producing crops.

He predicted that studies will show that rates presently recommended under many conditions are considerably below the optimum. He stated that agricultural scientists are finding that while one improved crop production practice is beneficial, "the advantages often pyramid when several good practices are used in the right combination, and recognition of this principle is spreading rapidly in research programs throughout the country."

Dr. Salter believes that so far we have no more than scratched the surface with this combined approach to research. "Of this we are sure, we have by no means exhausted the possibilities of still further increasing crop yields as we learn to combine in optimum degree the various factors of crop production under the diverse environments of soil and climate. We now recognize that past ideas of what constituted adequate fertility must be revised drastically upward if we are to strive for top yields through this combined approach."

Attendance at both conventions was high and it is safe to say that every industry man left with a renewed sense of his responsibility to American agriculture.

A Week to Remember

If one had a roster of all the weeks in the year which have been set aside to observe a worthy cause, he probably would find his calendar not only filled but carrying duplications for some weeks. These reminders have grown in number to the point of ridicule from "sophisticated" sources. However, we wonder in the fast pace of our American life if they are not serving a very useful purpose.

Certainly, there can be no question as to the importance of the sixth annual National Farm Safety Week, proclaimed by the President for 1949 as July 24-30, to every agriculturist, particularly when some of the facts are known. In full recognition of the necessity for a safe agriculture, the President in his proclamation does "hereby call upon the Nation to observe . . . and request all organizations and persons interested in farm life and welfare to join in a continuing drive against practices which endanger farm people in their homes, in the fields, and on the highways."

According to the Bureau of Agricultural Economics of the U. S. Department of Agriculture, during 1948 at least one resident out of every six farms was the victim of an accident involving one day or more lost from regular activities. The surveys on which the Bureau based its estimates indicated that at least $36,000,000 were spent last year for medical, dental, and hospital care resulting from accidental injuries to farm people. This estimate does not include the costs where people were killed or suffered permanent total disabilities, nor the value of lost time, which totaled about 17,000,000 days. Reports of time lost averaged about 20 days per accident. Medical care costs, as reported, averaged $43 per accident, and about a fourth of such costs were covered by insurance.

Further facts garnered by the estimates prove revealing. Falls were the leading type of accident and accounted for a fourth of all accidents to farm people. Machinery and animals each accounted for about an eighth. Sixteen per cent of all accidents to farm people occurred in the home, 56 per cent elsewhere on the farm, 11 per cent on roads or streets, and 17 per cent off the farm.

What can be done? Just what we are attempting to do with a review of these startling figures—publicize the importance of the National Farm Safety Week as a means of acquainting all interested in farm life with the necessity of guarding against accidents on the farm. The busy season is on—minds are preoccupied, bodies tired—all the more reason for a reminder. July 24-30, A Week to Remember!

Season Average Prices Received by Farmers for Specified Commodities *

Crop Year	Cotton Cents per lb.	Tobacco Cents per lb.	Potatoes Cents per bu.	Sweet Potatoes Cents per bu.	Corn Cents per bu.	Wheat Cents per bu.	Hay Dollars per ton	Cottonseed Dollars per ton	Truck Crops
	Aug.-July	.....	July-June	July-June	Oct.-Sept.	July-June	July-June	July-June	....
Av. Aug. 1909–July 1914....	12.4	10.0	69.7	87.6	64.2	88.4	11.87	22.55	....
1924.....	22.9	19.0	68.6	149.6	106.3	124.7	12.66	33.25	....
1925.....	19.6	16.8	170.5	165.1	69.9	143.7	12.77	31.59	....
1926.....	12.5	17.9	131.4	117.4	74.5	121.7	13.24	22.04	....
1927.....	20.2	20.7	101.9	109.0	85.0	119.0	10.29	34.83	....
1928.....	18.0	20.0	53.2	118.0	84.0	99.8	11.22	34.17	....
1929.....	16.8	18.3	131.6	117.1	79.9	103.6	10.90	30.92	....
1930.....	9.5	12.8	91.2	108.1	59.8	67.1	11.06	22.04	....
1931.....	5.7	8.2	46.0	72.6	32.0	39.0	8.69	8.97	....
1932.....	6.5	10.5	38.0	54.2	31.9	38.2	6.20	10.33	....
1933.....	10.2	13.0	82.4	69.4	52.2	74.4	8.09	12.88	....
1934.....	12.4	21.3	44.6	79.8	81.5	84.8	13.20	33.00	....
1935.....	11.1	18.4	59.3	70.3	65.5	83.2	7.52	30.54	....
1936.....	12.4	23.6	114.2	92.9	104.4	102.5	11.20	33.36	....
1937.....	8.4	20.4	52.9	82.0	51.8	96.2	8.74	19.51	....
1938.....	8.6	19.6	55.7	73.0	48.6	56.2	6.78	21.79	....
1939.....	9.1	15.4	69.7	74.9	56.8	69.1	7.94	21.17	....
1940.....	9.9	16.0	54.1	85.5	61.8	68.2	7.58	21.73	....
1941.....	17.0	26.4	80.7	94.0	75.1	94.4	9.67	47.65	....
1942.....	19.0	36.9	117.0	119.0	91.7	110.0	10.80	45.61	....
1943.....	19.9	40.5	131.0	204.0	112.0	136.0	14.80	52.10	....
1944.....	20.7	42.0	149.0	192.0	109.0	141.0	16.40	52.70	....
1945.....	22.5	36.6	143.0	204.0	127.0	150.0	15.10	51.10	....
1946.....	32.6	38.2	122.0	218.0	156.0	191.0	16.70	71.90	....
1947.....	31.3	38.0	156.0	215.0	235.0	241.0	17.30	85.40	....
1948									
June.....	35.22	41.7	187.0	246.0	216.0	211.0	17.90	92.20	....
July.....	32.99	43.6	166.0	262.0	202.0	203.0	18.20	96.00	....
August.....	30.41	47.4	158.0	265.0	191.0	196.0	17.80	76.60	....
September...	30.94	46.7	153.0	232.0	178.0	197.0	18.00	68.10	....
October.....	31.07	50.6	142.0	207.0	138.0	198.0	18.40	63.70	....
November....	30.52	42.8	144.0	198.0	121.0	204.0	18.40	69.00	....
December....	29.63	45.7	154.0	219.0	123.0	205.0	19.10	68.80	....
1949									
January.....	29.27	42.9	166.0	236.0	125.0	202.0	19.80	65.70	....
February.....	29.14	29.5	172.0	244.0	112.0	194.0	20.50	53.40	....
March.....	28.74	31.9	174.0	254.0	118.0	198.0	20.00	51.40	....
April.....	29.91	24.7	181.0	275.0	122.0	200.0	19.00	50.30	....
May.....	29.97	32.5	181.0	273.0	122.0	200.0	17.70	50.40	....
Index Numbers (Aug. 1909—July 1914 = 100)									
1924.....	185	190	98	170	166	141	107	147	143
1925.....	158	168	245	188	109	163	108	140	143
1926.....	101	179	189	134	116	138	112	98	139
1927.....	163	207	146	124	132	135	87	154	127
1928.....	145	200	76	134	131	113	95	152	154
1929.....	135	183	189	133	124	117	92	137	137
1930.....	77	128	131	123	93	76	93	98	129
1931.....	46	82	66	83	50	44	73	40	115
1932.....	52	105	55	62	50	43	52	46	102
1933.....	82	130	118	79	81	84	68	57	91
1934.....	100	213	64	91	127	96	111	146	95
1935.....	90	184	85	80	102	94	63	135	119
1936.....	100	236	164	106	163	116	94	148	104
1937.....	68	204	76	93	81	109	74	87	110
1938.....	69	196	80	83	76	64	57	97	88
1939.....	73	154	100	85	88	78	67	94	91
1940.....	80	160	78	97	96	77	64	96	111
1941.....	137	264	116	107	117	107	81	211	129
1942.....	153	369	168	136	143	124	91	202	163
1943.....	160	405	188	232	174	154	125	231	245
1944.....	167	420	214	219	170	160	138	234	212
1945.....	181	366	205	232	198	170	127	227	224
1946.....	263	382	175	249	212	209	141	319	204
1947.....	252	380	224	245	366	273	146	379	249
1948									
June.....	284	417	268	280	336	239	151	409	213
July.....	266	436	238	298	315	230	153	428	213
August.....	245	474	227	302	298	222	150	340	172
September...	250	467	220	264	277	223	152	302	150
October.....	251	506	204	236	215	224	155	282	176
November....	246	428	207	226	188	231	155	306	186
December....	239	457	220	250	192	232	161	305	209
1949									
January.....	236	429	238	269	195	229	169	291	282
February.....	235	295	249	279	174	219	173	237	285
March.....	232	319	250	290	184	224	168	228	263
April.....	241	247	260	314	190	226	160	223	236
May.....	242	325	260	312	190	226	149	224	213

Wholesale Prices of Ammoniates

	Nitrate of soda bulk per unit N	Sulphate of ammonia bulk per unit N	Cottonseed meal S. E. Mills per unit N	Fish scrap, dried 11–12% ammonia, 15% bone phosphate, f.o.b. factory, bulk per unit N	Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per unit N	High grade ground blood, 16–17% ammonia, Chicago, bulk, per unit N
1910–14	$2.68	$2.85	$3.50	$3.53	$3.37	$3.52
1924	2.99	2.44	5.87	5.02	3.60	4.25
1925	3.11	2.47	5.41	5.34	3.97	4.75
1926	3.06	2.41	4.40	4.95	4.36	4.90
1927	3.01	2.26	5.07	5.87	4.32	5.70
1928	2.67	2.30	7.06	6.63	4.92	6.00
1929	2.57	2.04	5.64	5.00	4.61	5.72
1930	2.47	1.81	4.78	4.96	3.79	4.58
1931	2.34	1.46	3.10	3.95	2.11	2.46
1932	1.87	1.04	2.18	2.18	1.21	1.36
1933	1.52	1.12	2.95	2.86	2.06	2.46
1934	1.52	1.20	4.46	3.15	2.67	3.27
1935	1.47	1.15	4.59	3.10	3.06	3.65
1936	1.53	1.23	4.17	3.42	3.58	4.25
1937	1.63	1.32	4.91	4.66	4.04	4.80
1938	1.69	1.38	3.69	3.76	3.15	3.53
1939	1.69	1.35	4.02	4.41	3.87	3.90
1940	1.69	1.36	4.64	4.36	3.33	3.39
1941	1.69	1.41	5.50	5.32	3.76	4.43
1942	1.74	1.41	6.11	5.77	5.04	6.76
1943	1.75	1.42	6.30	5.77	4.86	6.62
1944	1.75	1.42	7.68	5.77	4.86	6.71
1945	1.75	1.42	7.81	5.77	4.86	6.71
1946	1.97	1.44	11.04	7.38	6.60	9.33
1947	2.50	1.60	12.72	10.66	12.63	10.46
1948						
June	2.78	1.90	14.69	9.11	8.23	8.24
July	2.78	2.07	14.56	9.22	8.80	8.73
August	2.91	2.10	10.91	9.76	8.92	8.98
September	3.00	2.20	10.70	9.87	9.18	9.03
October	3.00	2.20	9.31	9.98	9.41	9.48
November	3.00	2.20	11.00	10.31	10.44	10.68
December	3.00	2.20	11.52	11.65	11.39	11.46
1949						
January	3.15	2.23	10.29	8.68	11.53	11.53
February	3.19	2.27	9.44	12.36	10.78	10.70
March	3.19	2.27	9.27	12.36	9.64	9.71
April	3.19	2.27	9.22	12.36	9.71	9.87
May	3.19	2.27	9.43	12.36	9.71	9.11
Index Numbers (1910-14 = 100)						
1924	111	86	168	142	107	121
1925	115	87	155	151	117	135
1926	113	84	126	140	129	139
1927	112	79	145	166	128	162
1928	100	81	202	188	146	170
1929	96	72	161	142	137	162
1930	92	64	137	141	12	130
1931	88	51	89	112	63	70
1932	71	36	62	62	36	39
1933	59	39	84	81	97	71
1934	59	42	127	89	79	93
1935	57	40	131	88	91	104
1936	59	43	119	97	106	131
1937	61	46	140	132	120	122
1938	63	48	105	106	93	100
1939	63	47	115	125	115	111
1940	63	48	133	124	99	96
1941	63	49	157	151	112	126
1942	65	49	175	163	150	192
1943	65	50	180	163	144	189
1944	65	50	219	163	144	191
1945	65	50	223	163	144	191
1946	74	51	315	209	196	265
1947	93	56	363	302	374	297
1948						
June	104	67	420	258	244	234
July	104	73	416	261	261	248
August	109	74	312	276	265	255
September	112	77	306	280	272	257
October	112	77	266	283	279	269
November	112	77	314	292	310	303
December	112	77	329	330	338	326
1949						
January	118	78	294	246	342	328
February	119	80	270	350	320	304
March	119	80	265	350	286	276
April	119	80	263	350	288	280
May	119	80	269	350	288	259

Wholesale Prices of Phosphates and Potash * *

	Superphosphate Baltimore, per unit	Florida land pebble 68% f.o.b. mines, bulk, per ton	Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton	Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports[1]	Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports[1]	Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports[1]	Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports[1]
1910–14	$0.536	$3.61	$4.88	$0.714	$0.953	$24.18	$0.657
1924	.502	2.31	6.60	.582	.860	23.72	.472
1925	.600	2.44	6.16	.584	.860	23.72	.483
1926	.598	3.20	5.57	.596	.854	23.58	.537
1927	.525	3.09	5.50	.646	.924	25.55	.586
1928	.580	3.12	5.50	.669	.957	26.46	.607
1929	.609	3.18	5.50	.672	.962	26.59	.610
1930	.542	3.18	5.50	.681	.973	26.92	.618
1931	.485	3.18	5.50	.681	.973	26.92	.618
1932	.458	3.18	5.50	.681	.963	26.90	.618
1933	.434	3.11	5.50	.662	.864	25.10	.601
1934	.487	3.14	5.67	.486	.751	22.49	.483
1935	.492	3.30	5.69	.415	.684	21.44	.444
1936	.476	1.85	5.50	.464	.708	22.94	.505
1937	.510	1.85	5.50	.508	.757	24.70	.556
1938	.492	1.85	5.50	.523	.774	15.17	.572
1939	.478	1.90	5.50	.521	.751	24.52	.570
1940	.516	1.90	5.50	.517	.730	24.75	.573
1941	.547	1.94	5.64	.522	.780	25.55	.367 [1]
1942	.600	2.13	6.29	.522	.810	25.74	.205
1943	.631	2.00	5.93	.522	.786	25.35	.195
1944	.645	2.10	6.10	.522	.777	25.35	.195
1945	.650	2.20	6.23	.522	.777	25.35	.195
1946	.671	2.41	6.50	.508	.769	24.70	.190
1947	.746	3.05	6.60	.498	.706	18.93	.195
1948							
June	.760	4.61	6.60	.330	.634 [1]	12.76 [1]	.176
July	.770	4.61	6.60	.353	.676	13.63	.188
August	.770	4.61	6.60	.353	.678	13.63	.188
September	.770	4.61	6.60	.353	.678	13.63	.188
October	.763	4.61	6.60	.375	.720	14.50	.200
November	.770	4.61	6.60	.375	.720	14.50	.200
December	.770	4.61	6.60	.375	.720	14.50	.200
1949							
January	.770	4.61	6.60	.375	.720	14.50	.200
February	.770	4.61	6.60	.375	.720	14.50	.200
March	.770	3.85	7.06	.375	.720	14.50	.200
April	.770	3.85	7.06	.375	.720	14.50	.200
May	.770	3.85	7.06	.375	.720	14.50	.200
Index Numbers (1910-14 = 100)							
1924	94	64	135	82	90	98	72
1925	110	68	126	82	90	98	74
1926	112	88	114	83	90	98	82
1927	100	86	113	90	97	106	89
1928	108	86	113	94	100	109	92
1929	114	88	113	94	101	110	93
1930	101	88	113	95	102	111	94
1931	90	88	113	95	102	111	94
1932	85	88	113	95	101	111	94
1933	81	86	113	93	91	104	91
1934	91	87	110	68	79	93	74
1935	92	91	117	58	72	89	68
1936	89	51	113	65	74	95	77
1937	95	51	113	71	79	102	85
1938	92	51	113	73	81	104	87
1939	89	53	113	73	79	101	87
1940	96	53	113	72	77	102	87
1941	102	54	110	73	82	106	87
1942	112	59	129	73	85	106	84
1943	117	55	121	73	82	105	83
1944	120	58	125	73	82	105	83
1945	121	61	128	73	82	105	83
1946	125	67	133	71	81	102	82
1947	139	84	135	70	74	78	83
1948							
June	142	128	135	62	67	53	80
July	144	128	135	65	71	56	82
August	144	128	135	65	71	56	82
September	144	128	135	65	71	56	82
October	142	128	135	68	76	60	83
November	144	128	135	68	76	60	83
December	144	128	135	68	76	60	83
1949							
January	144	128	135	68	76	60	83
February	144	128	135	68	76	60	83
March	144	107	145	68	76	60	83
April	144	107	145	68	76	60	83
May	144	107	145	68	76	60	83

Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and All Commodities

	Farm prices*	Prices paid by farmers for commodities bought*	Wholesale prices of all commodities†	Fertilizer material‡	Chemical ammoniates	Organic ammoniates	Superphosphate	Potash**
1924	143	152	143	103	97	125	94	79
1925	156	156	151	112	100	131	109	80
1926	146	155	146	119	94	135	112	86
1927	142	153	139	116	89	150	100	94
1928	151	155	141	121	87	177	108	97
1929	149	154	139	114	79	146	114	97
1930	128	146	126	105	72	131	101	99
1931	90	126	107	83	62	83	90	99
1932	68	108	95	71	46	48	85	99
1933	72	108	96	70	45	71	81	95
1934	90	122	109	72	47	90	91	72
1935	109	125	117	70	45	97	92	63
1936	114	124	118	73	47	107	89	69
1937	122	131	126	81	50	129	95	75
1938	97	123	115	78	52	101	92	77
1939	95	121	112	79	51	119	89	77
1940	100	122	115	80	52	114	96	77
1941	124	131	127	86	56	130	102	77
1942	159	152	144	93	57	161	112	77
1943	192	167	151	94	57	160	117	77
1944	195	176	152	96	57	174	120	76
1945	202	180	154	97	57	175	121	76
1946	233	202	177	107	62	240	125	75
1947	278	246	222	130	74	362	139	72
1948								
June	295	266	241	128	85	309	142	65
July	301	266	247	231	88	317	144	68
August	293	266	247	129	91	285	144	68
September	290	265	247	131	94	287	144	68
October	277	263	243	130	94	277	142	72
November	271	262	239	134	94	311	144	72
December	268	262	237	137	94	336	144	72
1949								
January	268	260	233	136	97	313	144	72
February	258	257	231	136	99	309	144	72
March	261	258	231	134	99	290	144	72
April	260	258	229	134	99	291	144	72
May	256	257	228	134	99	293	144	72

* U. S. D. A. figures. Beginning January 1946 farm prices and index numbers of specific farm products revised from a calendar year to a crop-year basis. Truck crops index adjusted to the 1924 level of the all-commodity index.

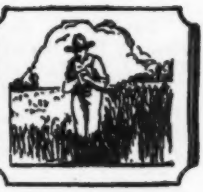
† Department of Labor index converted to 1910-14 base.

‡ The Index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management, Cornell University, Ithaca, New York. These indexes are complete since 1897 The series was revised and reweighted as of March 1940 and November 1942.

[1] All potash salts now quoted F.O.B. mines only: manure salts since June 1941, other carriers since June 1947.

**** The weighted average of prices actually paid for potash is lower than the annual average because since 1926 over 90% of the potash used in agriculture has been contracted for during the discount period. Since 1937, the maximum discount has been 12%. Applied to muriate of potash, a price slightly above $.471 per unit K_2O thus more nearly approximates the annual average than do prices based on arithmetical averages of monthly quotations.**

REVIEWS



This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

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"1948 Results of Plow Sole Fertilizer Demonstrations in Wisconsin," Soils Dept., College of Agr., Madison, Wis., Dec. 1948, C. J. Chapman.

"1948 Results of Fertilizer Demonstrations on Small Grain and Hay," Soils Dept., Univ. of Wis., Madison, Wis., C. J. Chapman.

"Commercial Fertilizers—1949," State Dept. of Agr., Madison, Wis., No. 293, Jan.-Feb. 1949, W. B. Griem.

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"Soil Fumigation for Cigar-Wrapper Tobacco Fields," Agr. Exp. Sta., Univ. of Fla., Gainesville, Fla., Press Bul. 655, Oct. 1948, R. R. Kincaid and G. M. Volk.

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Crops

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"Hogging-off Corn and Soybeans," Div. of Agr. Ext., La. State Univ., Baton Rouge, La., Ext. Leaf. 21, 1949, R. A. Wasson and A. D. Fitzgerald.

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"Evergreens," Agr. Ext. Serv., Univ. of Minn., St. Paul 1, Minn., Ext. Bul. 258, June 1948, L. C. Snyder, Raymond Wood, Clyde Christensen, and A. C. Hodson.

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Economics

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Sod-bound Western Meadows

By Jack F. Schinagl

Agricultural Extension Editor, University of Wyoming, Laramie, Wyoming

ONE big agricultural headache of the entire western United States is old, unproductive, sod-bound meadowlands.

Thousands of acres of such meadows —some 30 to 40 years old—are gradually dropping off in yield. When first established, they yielded from one to two tons of feed per acre. In 1945 the average yield was three-fourths of a ton per acre with only an approximate 40-per cent quality of the original seeding.

Ordinary meadow renovation and

Fig. 1. The tiller also pulverizes soil on unplowed meadows. Depth of penetration can be adjusted from one to five inches. This meadow of native grasses was 30 years old.

Fig. 2. Side view of tiller shows the mounted gas engine and the pulverized soil being kicked from the revolving hammers.

topdressings of barnyard manure and commercial fertilizers will stimulate growth for a few years, points out F. A. Chisholm, Wyoming Agricultural Extension Service Agronomist, but the yield trend will continue downward. Desirable grasses will continue to be crowded out by less desirable grasses.

The most effective and economical solution is that of plowing, leveling, and reseeding. That, too, used to be a problem when the land had not been touched by a plow from the time it was first established as a meadow. Now, however, equipment that will work these sod-bound soils into almost ideal tillable condition has been developed and is being improved.

Most of such newly-seeded meadows are put into various mixtures of timothy, alsike clover, alfalfa, and natural or native grasses. The mixture will depend, however, on existing water tables for the area.

¶ A good over-all picture of citrus growing, handling, and marketing is contained in the publication, "Citrus Industry of Florida," issued by the Florida Department of Agriculture in cooperation with the University of Florida. The first two sections make up the bulk of the 200-page bulletin and were written by Dr. A. F. Camp of the Citrus Experiment Station. Part I covers the various aspects of citrus growing including background history of citrus fruits, production in Florida and California, soil considerations, stocks, varieties, propagation, planting, cultivation, fertilization, pruning, pest control, irrigation, cold protection, cost data, and of particular interest to the small landholder, the management of what is called dooryard plantings. Part II covers packing-house operations; Part III, citrus marketing by Robert C. Evans of the Florida Citrus Commission; and Part IV covers citrus processing by L. G. MacDowell, also of the Florida Citrus Commission. This is an excellent practical bulletin for anyone interested in the citrus industry.

More Nitrogen for Sugar Cane

FERTILIZER experiments with sugar cane involving fertilization at two levels of nitrogen, one at 40 pounds per acre and the other at 60, were begun in 1945. The first year's results from these experiments showed that the highest yields of sugar were obtained on stubble cane with applications of nitrogen, P_2O_5, and K_2O at the 60-pound level. On plant cane the best results were obtained with a combination of 40 pounds of nitrogen with 40 pounds of P_2O_5 and 60 pounds of K_2O per acre.

The 1946 season was very wet and both plant and stubble cane responded profitably to nitrogen at the 60-pound per acre level. Generally the best adapted treatment was 60 pounds of nitrogen, 25 pounds of P_2O_5, and 40 pounds of K_2O per acre, and the increase in the yield of sugar from the combination of these amounts of plant food was approximately 1,800 pounds of sugar per acre. The increases in yield of sugar varied from 1,600 to 3,500 pounds per acre. The percentage of purity and the sucrose content were not depressed by fertilizers. The 1946 results showed that more nitrogen could be used on the very fine sandy loam, silt loam, and silty clay loam soils of the sugar cane area.

Nine experiments were conducted in 1947. Four of these experiments were with stubble cane and five were with plant cane. The 1947 growing season was very dry and normal yields were obtained at only two locations. In general, the yields were about 30 per cent below normal and the experimental errors were high. In 1947 the results showed that stubble cane responded significantly in three out of four experiments. In one on Commerce silty clay loam where the highest yields for the year were obtained the 60-25-40 mixture increased the yield of cane 17.1 tons and sugar 3,820 pounds per acre. In another, 40 pounds per acre of nitrogen alone was best, but the yield was low, 16.8 tons per acre, due to drought. In the third the 60-0-40 mixture was best; here also the yield was low. The data from the five experiments with plant cane indicated that the cane responded to fertilizer in three out of the five experiments. In two of the three, 40 pounds per acre of nitrogen alone was best, while in the other one the 40-40-40 mixture produced the highest significant yield.

The 1948 growing season like that of 1947 was very dry. Out of 10 experiments located in different soil areas of the sugar belt, seven gave data showing definite responses to fertilizer treatments. Five of these seven successful experiments were on stubble cane. The treatment consisting of 80 pounds per acre of nitrogen with 40 pounds of P_2O_5 and 60 pounds of K_2O gave the highest significant yields in three experiments, while the 60-25-60 was best in one and the 60-40-40 in the other. The increases at the 80-pound level of nitrogen with the minerals averaged 10.9 tons of cane and 1,890 pounds of sugar per acre. Two experiments with plant cane gave normal yields in 1948. In each of these experiments the 60-25-40 mixture gave the highest yield. The average increase was 12.0 tons of cane and 1,980 pounds of sugar per acre. In both cases, however, the complete fertilizer was not significantly better than 40 pounds per acre of nitrogen alone.

The source of P_2O_5 used in these experiments was superphosphate. The K_2O was supplied as muriate of potash. The nitrogen was supplied as ammonium nitrate except where ammonia was used as indicated. In this experiment anhydrous ammonia was compared to ammonium nitrate as a source of nitrogen. The data show that the two forms are equally effective.

The amount of nitrogen being applied to sugar cane in Louisiana has increased from slightly over 30 pounds

per acre in 1941 to almost 50 pounds per acre in 1948. This increase in the use of commercial nitrogen has compensated for the slackening off in the amount of legumes turned under and the increase in the amount of summer fallowing practiced in the control of Johnson grass.

Data from these experiments indicate that in most cases 40 pounds per acre of nitrogen can be profitably applied to plant cane.

The data also show that 60 to 80 pounds of nitrogen per acre, 25 to 40 pounds of P_2O_5, and 40 to 60 pounds of K_2O applied to stubble cane have definitely given good results under conditions of normal soil moisture and good weed control, and on soils of intermediate texture such as very fine sandy loams, silt loams, and silty clay loams. —V. E. Green, D. S. Byrnside, and M. B. Sturgis, *Agr. Exp. Station, Baton Rouge, La.*

Heredity Plus Environment Equal A Corn Crop

(*From page* 14)

corn leaf aphid are important environmental hazards. In such areas, a hybrid can not be considered adapted if it is susceptible to these insects. Hybrids should be purchased on the basis of proved performance. Too many are bought because of friendship or good salesmanship.

Furthermore, good soil and good weather plus a good hybrid do not necessarily equal a good yield. The tendency is to cultivate corn too deeply, and in an untimely and careless manner. This tendency is not entirely dissociated with the use of power tools. Growers forget that the roots are the nutrient-absorbing areas of the plants. There is no profit in encouraging corn breeders to produce hybrids with superior root systems only to have the roots pruned back by deep and careless cultivation. At the same time, corn should not have to compete with worthless weeds for water and soil nutrients.

Although pretty well known to scientists, too few farmers are using the yardstick of efficient corn production. This measure is explained and implemented by the accompanying "Corn Planting Chart." The basic unit of measurement is the half-pound ear, the average weight of ear which has shown to result in highest yields per acre. If the average weight of ear from a field is above .6 pound, the number of plants per acre should be increased 2,000. This rule of thumb applies for plant populations up to 15,000. Caution should be used in exceeding 15,000 plants. If the average ear weight is below .6 pound, the plant population should be decreased 1,000 plants per acre. Ears larger than .6 pound may be handsomer and more easily husked by hand, and thin stands make for big ears, but also for low yields. Large ears do not indicate efficient production.

Obviously, adjustment of the planting rate and of the fertility level of a field must be considered jointly if the aim is efficient production. It is equally obvious that no one can make a blanket recommendation that will fit all farms or fields. The amount of fertilizer to apply and the plant population must be determined to some extent on the basis of experience. We have no way of knowing in advance exactly what the average ear weight

will be, although if ears of last year's crop are weighed, a very useful indication may be obtained.

That planting rate may be adjusted to fertility level to the profit of corn growers has been pretty conclusively demonstrated by Murray McJunkin, Vo-ag member of the Pennsylvania Station Corn Team. Startling increases in corn yields have been obtained by hundreds of students throughout Pennsylvania working in McJunkin's corn projects. Mr. McJunkin will report his findings in detail in a subsequent issue of Better Crops. He will show how experimental results were duplicated by farm boys under the guidance of teachers.

Some Photographic Hints

(*From page* 10)

you should assume that it will be. Never hurry. Time spent in arranging the subject-material is never wasted. Field plots should have unnecessary weeds and grass in the foreground removed. The photographing of livestock offers many special problems. Many times a whistle given at the moment the shutter is clicked will cause the animals to look at the camera.

2. If signs are shown in the picture, have them simple black-on-white and avoid fancy decorations. Be sure they are in focus.

3. Avoid confusing backgrounds when possible.

4. Hold your camera steady. If possible, use a tripod for all pictures. Certainly use a tripod for all pictures taken slower than a fiftieth of a second. If you have no tripod and cannot rest your camera against a tree or on a stump, then take a deep breath and hold it as the shutter is snapped. A good means of holding the camera steady is to tie one end of a string to the camera and hold the other end under your foot, with the string tight.

5. Always have the sun at your back if possible. At least do not "shoot into the sun."

6. If you do not do your own processing, then choose the photographic studio which does it for you carefully.

The Search for Truth

(*From page* 18)

eases to which men and animals are heir. Previous to his day, when smallpox, hydrophobia, anthrax, cholera, and similar microbial diseases broke out in any given area, nothing could be done about them but to let them run their course. Men died by the thousands, and even by the millions, from these and similar scourges. But with Pasteur came modern serums, antiseptic surgery, and great expectations for disease control.

The age-old notion of spontaneous generation by which living things emerged from nowhere still had a firm hold on the superstitious minds of men. But Pasteur showed that the decay of plants and animals was brought about by organisms so small that thousands of them could cling to a pin point, or float about on a particle of dust. To the end of his distillation flask he fitted a long S-shaped tube that permitted the movement of air but prevented the flow

of dust, and spontaneous generation was stopped cold.

Over in England another pioneer, Charles Darwin, was busily engaged in gathering evidence to support an enormous doubt that had arisen in his mind as to the fixity of species. Out of this doubt was finally born a concept which holds that man is the fulfillment of an evolutionary process. This process began with the merest microbe and ended with the most complex of the plant and animal forms that surround us. Darwin's concept was so revolutionary that only the most courageous of men dared to espouse it in Darwin's day. The concept of evolution is still dangerous to deal with in many portions of the globe, not excluding considerable areas in the United States of America.

The search for truth goes forward in cycles. Every so many years, or centuries, we find ourselves back at the same starting point, but in the course of an ever-enlarging circle that reaches out greater distances into the unknown. Copernicus had dared to say that man was not the center of the universe. Now, three centuries later, Darwin pointed out that man was merely the highest round in an evolutionary ladder, and that, somehow, he had become endowed with a brain and an imagination that largely enabled him to control his own career. Yet both Copernicus and Darwin were targets for the religious bigots of their day, Copernicus because he thought of man as a mere speck on the horizon of the universe, and Darwin because he conceived of man as having risen out of the slime of the ages.

But the field of thought had been so enlarged by the studies that culminated in Liebig's, Pasteur's, and Darwin's findings that men began to visualize enormous possibilities in harnessing science to their own use. Dictators found in science the perfect weapon for controlling their own subjects and for conquering their neighbors. Industrialists saw in science a means for amassing great wealth. Scientists, themselves, hoped that, by science, they could somehow build a better world out of the chaos in which we live.

Supported by governmental and private funds alike, science branched out into a great variety of fields of endeavor. Mathematicians and physicists quickly became engineers, architects, and builders of dynamos, motors, airplanes, and atomic bombs. Chemists were soon engaged in tremendous undertakings which were so involved that they had to break them up into pieces, and assign these pieces to bio-chemists, physical chemists, industrial chemists, and chemical engineers. Biologists no longer found it possible to keep in touch with the whole field of this evolutionary science, but began confining themselves to such parts of the problem as botany, zoology, ecology, microbiology, physiology, genetics, entomology, pathology, parasitology, and nutrition.

To follow all of these lines of exploratory research forward from the days of Liebig, Pasteur, and Darwin is more than any one man can hope to do in any adequate way. Suffice it to say that the search for truth has gone rapidly forward with an ever-increasing rate of accomplishment. Unfortunately, at the moment, the constructive and destructive forces of science are in conflict, and progress in some of the most important fields of research is being delayed.

At this point we must stop and consider which of the many possible avenues of approach to the truth offer the greatest promise. Do we believe that the best road to a better world is by way of the physical sciences that give us ever faster automobiles, clearer television, speedier airplanes, and more destructive bombs with which to hold our enemies in check? Should we follow the ever-widening highway of the biological sciences that provide us with such remarkable remedies as penicillin and streptomycin, by which we are able to by-pass disease and reach the ranks of the centenarians? Would

it be better to choose the route that leads to vastly increased production of good food so that all the people, all over the earth, are well fed?

"The moving finger writes and, having writ, moves on: nor all your piety nor wit can lure it back to cancel half a line, nor all your tears wash out a word of it." And that holds for the accomplishments of the physical and the biological sciences. Certainly none of the remarkable developments in these fields of endeavor can be erased, and none of us would want them to be. They are, moreover, the mere beginnings of much greater accomplishments that are yet to come. Maybe we shall fly to Mars and, hopefully, return. But there are other tangled trails that lead to truth, and these must also be explored. The entrance to these is found in the yearnings of mankind, as revealed by his history, literature, art, religion, and music. But there is a much more difficult and dangerous path, that of the social sciences, which not only holds great hope but offers great promise of helping man understand himself. These, like all the other trails to truth, must not only be kept open but they must be greatly widened so that ever more men of science are tempted to explore them.

Certainly, if we are unable to keep open the way that leads to the Ultimate Truth, there is little hope for mankind. The problem is one that engages the attention of the most intelligent men on earth. Unfortunately, out of some two billion transient souls that inhabit the globe at any one time, only a relatively small number have been endowed with the capacity to formulate new concepts and to carry them through to dependable conclusions. On the shoulders of these mentally better-endowed men rests the special obligation of saving the world from its own follies. And on the shoulders of the rest of us lies the equally important obligation of encouraging them in their work.

David Starr Jordan, in his book on "Life's Enthusiasms," quotes an ancient author who said:

"My son, you must store up a lot of absurd enthusiasms in your youth, else you reach old age with an empty heart, for you lose many of them by the way."

If I may be permitted to offer a wish for the younger generation, it is that they may be inspired with absurd enthusiasms to search for truth, whatever the field of endeavor with which they may be concerned. In proportion as they can uncover the truth and apply it, they are fulfilling the highest purpose of mankind.

Recommended Practices for Growing Peanuts

(*From page* 22)

peanut leaves in July. Since farmers have been accustomed to this disease, many have considered it the natural development of peanuts and thought that nothing should be done about it. However, numerous experiments, demonstrations, and experiences of farmers have shown that better yields are usually obtained where the leaf spot disease is controlled by three applications of dusting sulphur or copper-sulphur, with the first application made between July 1 and 15 and repetitions at 14-day intervals. Any application that gets washed off by heavy rains should be repeated within 24 hours. An average of 37 demonstrations conducted by Bertie farmers over a 10-year period gave an increase of more than 300 pounds of nuts per acre from dusting.

Fig. 5. Many farmers have learned the hard way the importance of better stacking.

It should be borne in mind that, since controlling leaf spot results in more foliage being on the plants when they are dug, they will need additional time to dry out before being picked. Where weather is favorable it appears to be desirable to let them cure a day or two before stacking. During the past two seasons many farmers have learned the hard way the importance of better stacking. It seems to have been the practice with many farmers to do a rather poor job of stacking, making sorry stacks and leaving considerable dirt in them. I have heard it said by Bertie farmers many times that peanuts are stacked the poorest in Bertie County of any county in the belt. In talking with County Agents in other counties they report that farmers in their county do the poorest job of stacking the crop, so it appears that no county has a monopoly on this feature. The wet seasons in the falls of 1947 and 1948 caused many to see the importance of doing a better job of stacking the crop, and it appeared that the 1948 crop was stacked better than the 1947 crop.

We have seen how the average corn yield in North Carolina and other Southern states is being increased through the adoption of the five steps for increased yields. We have also seen how flue-cured tobacco yields have been increased during the past 15 years by following improved practices. Even though peanuts are referred to as a crazy crop and the statement is made that nobody knows anything about it, enough has been learned by our Experiment Stations in recent years to indicate that if peanut growers would adopt the recommended practices in peanut production, as much yield could be made on the reduced acreage for 1949 as in normal years. Briefly these improved practices include the following:

(1) Plant the allotted acreage on the best peanut land.
(2) Have a soil test to determine the need of lime and fertilizer.
(3) Prepare a good seedbed.
(4) Use the best seed available of the variety grown in the community. Treat seed with Arasan.
(5) Plant between April 25 and May 10.
(6) Compare thicker spacing with normal spacing for the farm. It is suggested that 2-foot rows and

6-inch spacing in the row be tried for Va. Bunch. For Jumboes 6 to 8 inches in the row with rows 33 inches.

(7) Follow the recommendations of soil test report on fertilization. If lime was needed, it should have been broadcast some time in advance of planting, especially if dolomitic lime is used. Where potash is applied directly to the crop, apply it just as the peanuts are cracking the soil.

(8) Run a weeder over the land just before and just after the peanuts come up, going diagonally with the rows in both directions. Cultivate shallow and do not cover up the peanut plants. If a rotary hoe is available use it on the cultivator while the peanuts are small to reduce the expense of hoe work.

(9) Apply 400 pounds of gypsum or land plaster early in July so as to cover the row space where peanuts are developed.

(10) Make three applications of dusting sulphur or copper-sulphur at 14-day intervals, starting between July 1 and 15. Allow dusted peanuts additional time to cure on account of having heavier foliage.

(11) Get the dirt out and stack the peanuts so they can stand rain. Use poles that will stand up.

The corn program was started with a few one-acre demonstrations in each county. These demonstrations proved the program to be sound. It is suggested that farmers follow these recommendations for peanuts on one acre, or even one stack row and compare the results with their normal practices in growing peanuts.

Clover—A Symbol of Prosperity

(*From page* 26)

Each year, up to 1927, the use of lime increased by a hundred per cent. There are now as many County Agents as there were lime users at the beginning of the campaign. Paul Schowengerdt knew the name of every farmer in the State who used lime in 1923, and he got this information from limestone companies. He went to the implement companies to learn who had bought small lime pulverizers.

The story of the campaign is not complete without mention of the Clover and Prosperity Special Train, put on in Northeast Missouri, by the Burlington and the Q. O., and K. C. Railroads. The coming of the five-car Special was indeed a great day. Business men put on Dollar Days, and telephone operators broadcast over country lines the news about the time of arrival. Usually, a band played as the train pulled in.

Four railroad officials, and four specialists from the College of Agriculture traveled with the train. There were two cars of exhibits emphasizing the fact that clover is a symbol of prosperity, and how to grow legumes. The charts were striking, impressive, and easily understood.

Many farmers brought soil samples to the soil-testing car, and for those who missed the Special, a scooter train followed. Samples were marked and left with the station agent in advance of the arrival of the scooter.

The Clover and Prosperity Conferences have grown enormously during the past 25 years. The real planning is done by the farmers themselves. The legume problem is being solved. Other specialists carry on the work, and the Conference now has a new name. It is called Soils and Crops Conference, but

to many of the old-timers it is still "Clover and Prosperity."

The Soils and Crops conferences this past winter drew a record attendance, 29,875, even in the face of ice storms and bitter weather. The total this year exceeded by more than 2,000 the previous record.

Held in every county of the State, the meetings formed a high point in each county's winter agricultural program. The general pattern for the gatherings was to begin with local farmers telling their experiences with the better practices. Then, the Production Marketing Administration program for 1949 was explained by a local committeeman.

In many places, civic or business groups provided the noonday lunch. In the afternoon, the county agent and a specialist from the Missouri University Agricultural Extension Service discussed Balanced Farming practices which would receive attention in 1949.

Specialists from the state extension office who took part in these included J. Ross Fleetwood, Arnold Klemme, O. T. Coleman, John Falloon, William Murphy, and C. R. Meeker.

Kernels and Combines

(*From page* 5)

livery to storages that sometimes still contain large consignments of last year's bounty is now our dilemma. We have outwitted the old labor monopoly of the "wobblies" only to transfer our problem to maintaining wheat quality by safe, clean, and prompt storage facilities—minus mold and insect injury.

It is usually calculated now that by the end of August all of the winter wheat should be under suitable cover—but in many cases this has been impossible. Right behind the winter wheat flow will come the high piles of spring grain, demanding that the industry in some manner provide the needful protection—for why raise a bumper crop of anything valuable only to waste it afterwards?

Last summer in one Kansas town of a few hundred folks every available regular wheat elevator was brimful a week after the combine crews swept into the golden grain fields. So they desperately turned the elevator carrier spouts into a large four-story building, pouring in the oceans of grain steadily for two days, until the metal sides of the structure collapsed under tons of pressure, with the wheat breaking through in a Niagara of kernels to spill on the adjacent ground below. Before the job was done, they say, a tower of loose wheat rose to the top of the building, almost hiding it from the view of passers-by.

Thus the impact of the speedy wheat-gathering business hits mills and elevators in the short spell of three weeks. Some data on just how much faster it arrives come to notice. About 30 years ago, for example, the number of railroad cars received at Kansas City in the months of July and August carried about 15 per cent of the total carloads of wheat expected for the season. In the past five years, the receipts during the same midsummer period represent just about 50 per cent of the crop to come.

The presence of old wheat aggravates the storage situation. Including local and terminal elevators in seven of the large winter wheat states, there was in May of this year a reduction of public storage capacity reaching 45 million tons—mostly government loan wheat

being snugly ensconced in that amount of space. To move out the old grain covered by government loans and purchase agreements, the railroads in April assembled about 20,000 boxcars at country stations in the West. It seems from latest guesses by railroad spokesmen that plenty of cars are handy to handle the wheat this summer—if and when the right amount of storage room is ready.

BECAUSE the loading of more railroad cars to haul new wheat to elevators is a useless job when the mills are running behind on grinding fresh receipts, when the terminal storages are full, and switch-yards blocked with waiting cars, embargoes on more shipments from the harvest zones must be imposed. Go out to Oklahoma, Kansas, or the Dakotas and Montana sometime this summer and you'll get a better idea, from the lines of waiting grain trucks, why these jams and embargoes happen so often.

This season the government has tried to take direct action in helping to get new storage, to furnish a little government space to shelter some wheat, and to offer so-called distress loans to growers in regions where a few weeks of outdoor, exposed wheat dumping will not seriously harm the grade and quality. Moreover, to be extra kind about it, Uncle Sam's wheat buyers have promised that if a wheat grower signs up for a distress loan with makeshift storage he will not be docked or penalized in case there is a drop in the wheat grade before he can get satisfactory storage facilities.

But the feeling is general that if the government continues to lend support to the wheat price through loans and purchase agreements, this offer will be whittled down to a reduced acreage next year. Any plan that thrusts the American wheat grower into world competition with producers elsewhere on low-priced land—as a surplus implies—cannot be entirely offset by government aid. Wheat leaders are busy these hot days working on allotments and possible market quotas, too.

Counting the 1944 reserve stocks on hand July 1 of that year, and adding the enormous bushelage of wheat produced in the six subsequent harvests, this country has handled about seven and a half billion bushels. Close to two and one-half billion bushels of that volume have been sent abroad under the various plans afoot in the past six years. Consumers here at home meanwhile have eaten their "wheaties and toast" to the tune of somewhat over three billion bushels. We have fed somewhere near one and a quarter billion bushels of wheat—not all the finest grade—to livestock which we were bent on raising for wartime and postwar demand. The rest is what we used to sow more wheat, to get more big crops, to fill more storages, and hunt more outlets. Seed amounts to only 85 million bushels —needed these days to reap over a billion bushels return.

Nobody enjoys retailing woe or forebodings of any kind to make fuel for depressed activity. Yet in some degree it is never sound policy to stick your brains in the sand, like an ostrich, hoping to dodge consequences or escape current trends. Neither can perennial postponement of decisions or tossing of responsibility to the public in general—or to the government—serve the purposes of courageous men. Countries that follow such a blind and secretive course play into the maws of the dictator and revolutionists. It's not the American way. We face our dilemmas finally and conquer them.

GROWERS did not reduce the wheat acreage by a slight percentage in 1949. They increased it. The June crop report says we have a prospective all-wheat output of 1,337,000,000 bushels, just now rated second of record in volume but likely to top everything hitherto before the final spring wheat toll is taken. I have even heard well-

sustained estimates by the trade that reckon our 1949 production close to a billion and a half bushels. So we can look forward to providing ample home supplies for eating, feeding, and seeding, with about 650 million bushels looking to foreign outlets. If the present season's exports reach 450 million bushels we will be keeping a good pace.

The new international wheat agreement offers some stability. It took the delegates a long time to hatch it out, and Congress did a lot of debating before it was ratified. It would go into force as of September 1, 1949. It sets a range of prices within which 456 million bushels of wheat (168 million composed of U. S. stocks) will move into world commerce each year.

Thus we cannot by artificial means entirely escape the weight of responsibility for the situation now being faced. Growers hiked the wheat acreage 14 per cent above the goal which wheat farm leaders themselves helped to suggest. The 82 million acres of seeded wheat this year won't all be harvested probably, but such as it is, the outlook for combining for ourselves an acreage about 24 per cent better than the annual 1939-43 average is real and persistent.

STOCKS of wheat found in the four big exporting countries early this year were over 550 million bushels, which, although very large, is nothing like the one and three-fourths billion bushels which those same exporters had ready to unload back in July 1943. Our own wheat exports at around 475 million bushels or so could be realized with the international agreement in force that grants us 168 millions in the world pool. This is because we have extra foreign outlets through military takings and non-agreement countries, with some chances for sales to agreement countries beyond the levels set down as minimum. There will be great dickerings and doings from now on to ease our burdened storages via the ocean routes.

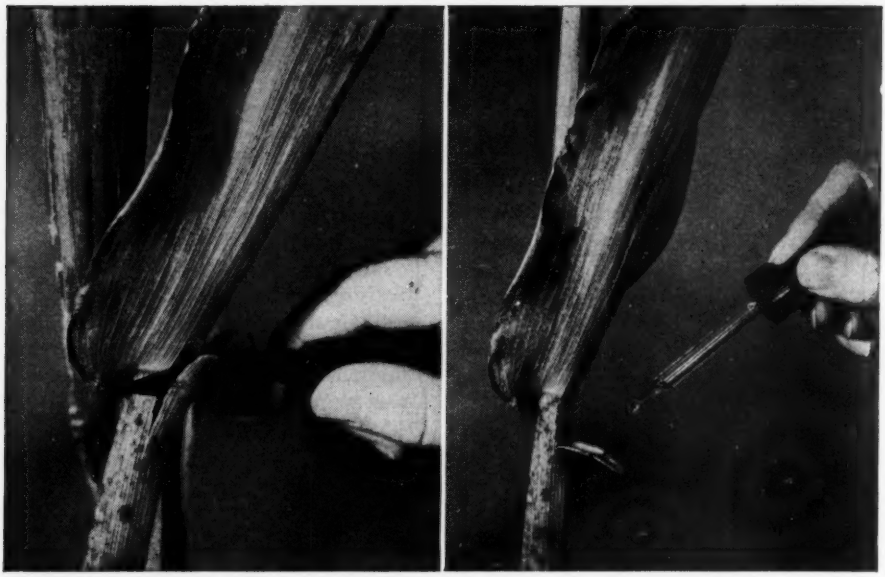
One of the interesting points about the wheat expansion deal that you notice when scanning the well-thumbed monthly crop reports is that some of the normal livestock-raising specialty states are growing more wheat than usual. New York, Pennsylvania, Illinois, Michigan, and Colorado are fair examples. If prices falter as the markets get clogged, considerable of the wheat in such areas may be fed. Yet we are watching the corn crop also, to see how it pans out on top of the finest pasture growth for cattle that recent years have known. One sure thing we can bank on—starvation is not our lot.

I RECKON it all boils down finally to some sort of acreage allotments—which wheat growers may have imposed on them without any choice—and maybe, if bins explode, to marketing quotas also. In any event, growers will have a vote before the quotas and penalties attached to excess marketings become effective.

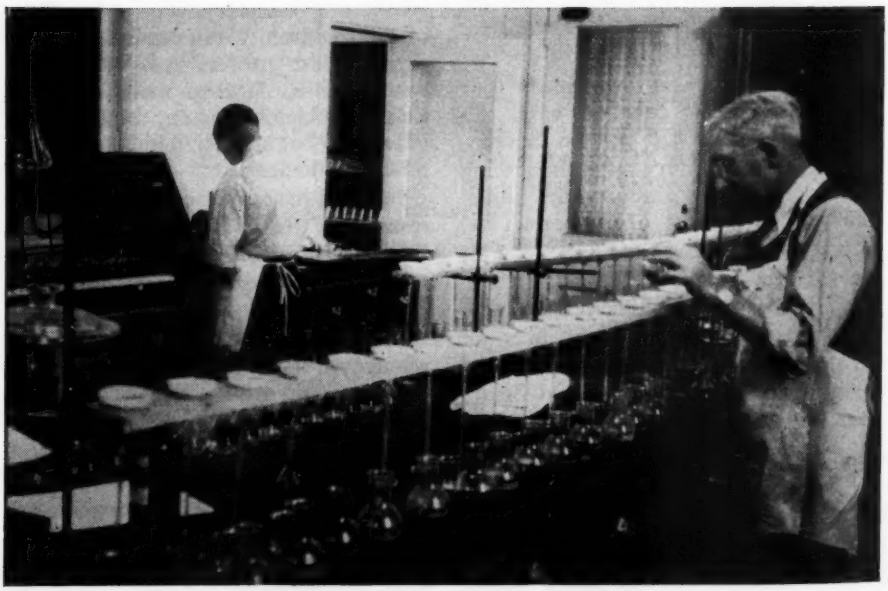
Uncle Sam isn't doing all this planning from his multitude of Washington and state offices either. The great bulk of the "grief" and the preliminary spinning of details is now being handled in the community outposts manned by expert wheat growers themselves. As stated before, America meets its own knotty problems head-on, sometimes a little late, but usually with blunt and forthright honesty.

In fact, I have noticed that the fellows in the field are ready to jump and perform tough assignments well ahead of the guys at headquarters who are often so timid about "federal interference." You see, my friends, only a small percentage of the chaps in Washington have been there very long. They remember what they said about the centralization of authority while they were in the states, and hence we see caution and prudence—almost to the point of hesitation.

Yes, we too can help in a pleasant way—by increasing our own allotments of waffles, wheat cakes, and breadstuff.



Nitrate tests can be made at the base of the leaf midrib without destroying the entire plant. This is an important consideration in making numerous tests on small experimental plots. The height of the plant at which nitrates are present as well as the intensity of the blue color gives an indication of the nitrate status of the plant.



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Testing can be done "on the spot" or samples brought inside as desired. Simply add testing solutions to the soil in test tubes, shake up and compare colors. Durable color charts are specially designed with acetate windows. Colors are compared by holding alongside test tube so both are read with transmitted light.

ORDER TODAY from your supply house or direct from Sudbury Laboratory.

SUDBURY LABORATORY

Box 883 **South Sudbury, Mass.**

Dealers Write for Special Offer

The reason why my gal reminds me of a switchboard is because when she walks all her lines are busy.

★ ★ ★

HE KNEW

A motorist was rolling down the road at sixty miles, when he crashed into a load of hay and upset it. "Hadn't you better tell your father?" he said to the farm boy who stood looking at the upset hay.

"He knows," replied the boy.

"He knows? But how can he?"

"He's under that thar hay."

★ ★ ★

Mandy went in the the bank and, digging down into her ample bosom came up with 35 dollar bills to deposit. "Why, Mandy," said the Teller, "have you been hoarding."

"No, sah," replied Mandy. "Ah made this money takin' in washin'!"

★ ★ ★

Specialist: "This eccentricity you speak of in your daughter—isn't it, after all, a matter of heredity?"

Mother (severely): "No, sir! I'd have you know there never was any heredity in our family!"

★ ★ ★

A certain guy who came home very late and very unsteady had a brilliant idea. He stopped in the kitchen and tied together all the pots and pans he could find. Then he proceeded upstairs, dragging the kitchenware and muttering confidently, "She'll never hear me in all thish racket."

The old farmer was dozing in the shade of his front porch, when a high-pressure salesman bustled up the front walk and awakened him with a cheery "Good afternoon." He had a sample book of a 10-volume set on scientific agriculture he was selling.

The old farmer was at length persuaded to page through the specimen volume.

"Nope," he objected, "ain't got no use for it."

"But you ought to have it," the salesman insisted. "It will teach you to farm twice as good as you do now."

"Hell, son," barked the ancient agriculturist, "I don't farm half as good now as I know how."

★ ★ ★

Before the Judge in a county court a woman moaned, "I'm sure my husband is unfaithful to me because not one of the children looks in the least like him."

★ ★ ★

Funeral services were being conducted for a woman who had been thoroughly disliked in her rural community. With a violent explosive disposition she henpecked her husband, drove her children mercilessly and quarreled with her neighbors. Even the animals on her place wore a hunted look.

The day was sultry and as the service ended the storm broke furiously. There was a blinding flash followed by a terrific clap of thunder.

"Waal, she's GOT there?" a mourner said.

FERTILIZER BORATE

more economical

FOR AGRICULTURE

Authorities have recognized that the depletion of Boron in soil has been reflected in limited production and poor quality of numerous field and fruit crops.

Outstanding results have been obtained with the application of Borax in specific quantities, or as part of the regular fertilizer mix, improving the quality and increasing the production of alfalfa and other legumes, table beets, sugar beets, apples, etc.

The work and recommendations of the State Agricultural Stations and County Agents are steadily increasing the recognition of the need for Boron in agriculture.

Boron is a plant food element and is commonly obtained from Borax since the element does not occur in the pure form. Fertilizer Borate is a sodium borate ore concentrate containing 93% Borax.

Fertilizer Borate was placed on the market by the makers of "20 Mule Team Borax" as a fertilizer grade product to save cost of refining and hence to supply Borax at the lowest cost.

Fertilizer Borate is packed in 100 lb. sacks. Address your inquiries to the nearest office.

PACIFIC COAST BORAX CO.

NEW YORK • CHICAGO • LOS ANGELES

THE PLANT SPEAKS

A new four-reel series of 16 mm., sound, color films which may be booked independently or in any combination. They may be used to best advantage when shown at least one day apart and in the following sequence:

THE PLANT SPEAKS THRU DEFICIENCY SYMPTOMS pictures soil depletion, erosion, and deficiency symptoms on plants. (Running time 25 min. on 800-ft. reel.)

THE PLANT SPEAKS, SOIL TESTS TELL US WHY depicts taking soil samples on the farm and the interpretation of soil tests. (Running time 10 min. on 400-ft. reel.)

THE PLANT SPEAKS THRU TISSUE TESTS shows the value of tissue testing and the procedure for testing plant tissues in the field. (Running time 14 min. on 400-ft. reel.)

THE PLANT SPEAKS THRU LEAF ANALYSIS evaluates leaves in plant growth and leaf analysis in determining fertilizer needs. (Running time 18 min. on 800-ft. reel.)

We shall be pleased to loan these films to agricultural colleges, experiment stations, county agents, vocational teachers, responsible farm organizations, and members of the fertilizer trade.

OTHER 16MM. COLOR FILMS AVAILABLE FOR TERRITORIES INDICATED

Potash in Southern Agriculture (South)
In the Clover (Northeast)
Bringing Citrus Quality to Market (West)
Machine Placement of Fertilizer (West)
Ladino Clover Pastures (West)
Potash from Soil to Plant (West)
Potash Deficiency in Grapes and Prunes (West)
New Soils from Old (Midwest)
Potash Production in America (All)
Save That Soil (All)
Borax From Desert to Farm (All)

IMPORTANT

Requests should be made *well in advance* and should include information as to group before which the film is to be shown, date of exhibition (alternative dates if possible), and period of time of loan.

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